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ABSTRACT

This collection of nine essays is an outgrowth of a study which was conducted by the Office of Library Programs to identify researchable issues that could help librarians fill a position of leadership in the information society. An introduction to the collection describes the study and includes a list of the 10 major issues identified by field-nominated experts as being the most important to the profession: (1) information policy issues; (2) education and training of librarians; (3) access to information; (4) archives and preservation; (5) organization, indexing, and retrieving materials; (6) role of the public service librarians; (7) library funding and economics; (8) libraries and education; (9) information users and needs; and (10) library models. It is noted that the essays in this collection were commissioned to explore these topics and were subjected to several stages of review prior to publication. References and/or notes are provided for each paper as well the reviewers' comments and recommendations for additional research issues. Also included is a summary of an international teleconference offered via Worldnet which was held in Washington, D.C., with interactive participants in Cologne, Frankfurt, and Stuttgart, West Germany. A list of participants in the study is attached. (CGD)

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RETHINKING THE LIBRARY

in the information age

VOLUME II

RETHINKING THE LIBRARY

in the information age

VOLUME II

ISSUES IN LIBRARY RESEARCH: PROPOSALS FOR THE 1990s

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PREFACE

In September 1986, the Office of Library Programs launched the project, "Issues in Library Research: Proposals for the 1990s." The project investigated library and information science issues to assess the current state of the profession and identify a research agenda to lead us into the next decade.

The "Information Age" has become accepted nomenclature for describing the increasingly technological nature of our society. As we move toward the third millenium, the part libraries will play in this age is still unclear -- many assert they are *the* institution to usher society into the Information Age, while others maintain that the library as we know it is headed for obsolescence. Which view will time bear out? Are libraries finding a niche fast enough in this dynamic environment to secure any role at all, much less a role as information leaders? And most importantly, if libraries cannot weather the changes, do the citizens of this country know what is at stake?

This publication represents the thinking of some of the foremost library and information science specialists in the country. It is my hope that the research suggested here will take steps toward clarifying what libraries are and what they can become.

Chester E. Finn, Jr.
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CONTENTS

Page

Introduction 1
Anne J. Mathews

Information Policy Issues: Putting Library Policy in Context 9
Louis Vagianos and Barry Lesser

Education and Training of Librarians 43
Robert M. Hayes

Education and Training of Librarians 75
Beverly P. Lynch

Research Issues in Information Access 93
Pat Molholt

Selecting Information of Enduring Value for Preservation 115
Richard J. Cox and Lynn W. Cox

Organizing, Indexing, and Retrieving Information 131
Raya Fidel

Information Needs: Old Song, New Tune 159
Joan C. Durrance

The Role of the Public Services Librarian: The New Revolution 179
Brian Nielsen

Library Funding and Economics 201
Yale M. Braunstein

Libraries in the 1990s: The German Perspective 215

List of Participants 219

INTRODUCTION

This collection of essays addresses the future of libraries: how they fit into our "information society," how they must adapt to social and technological change in order to play a meaningful role in that society, which elements of their traditional roles must be preserved and which abandoned, and how the education and training of library professionals must be restructured to create both practitioners and researchers who can shape the future of librarianship.

These published essays are an outgrowth of a study conducted by the Office of Library Programs. The study was designed to identify researchable issues that could help libraries fill a position of leadership in the information society. As part of the study, a series of four meetings was held during 1986-87, at which field-nominated experts identified issues they considered most important to the profession. From transcripts of the four meetings, a list of major issues was generated. They included:

- Policy issues: federal, state, and local roles and responsibilities
- Education and training of librarians
- Access to information
- Archives and preservation
- Organizing, indexing, and retrieving materials
- Role of the public services librarian
- Library funding and economics
- Libraries and education
- Information users and needs
- Library models.

A series of papers was commissioned to explore these topics. Each author, selected by his or her peers, outlined the general approach that would be taken in the paper, and then met with me to flesh out the proposal. No specific guidance was imposed by my office, nor was any form or specific point of view advocated. Each essay reflects the thinking of its author or authors, free of editorial influence concerning content of the paper or the overall collection.

At first draft stage, each paper was reviewed by three subject experts, and the authors were given the opportunity to incorporate suggested changes. Each final paper was again reviewed by three specialists on the topic, with an eye toward identifying additional areas of investigation. An unusual feature of the book is the inclusion of the reviewers' comments and recommendations for additional research issues following each of the essays in the collection.

Another phase of the 18-month study involved a cooperative effort between the Office of Library Programs and WorldNet/USIA. Together, we began to host international teleconferences linking us to U.S. embassy posts in Europe and Latin America for discussion of issues identified in our four meetings. The first teleconference was held on November 4, 1987, with three German posts: Frankfurt, Stuttgart, and Cologne. Participants from the United States were Robert M. Hayes (Dean of the UCLA School of Library and Information Science) and Sharon Rogers (University Librarian, George Washington University). There were seven German participants, and the teleconference was heard by 400 people at various posts throughout Europe. A second teleconference took place on May 17, 1988, with U.S. posts in Tel Aviv, The Hague, London, and Cologne. The subject was CD-ROMs. Several other countries have also requested their own interactive teleconferences, and planning for these is now in progress.

The results of our study will be summarized in the following publications:

- This collection of essays, enriched by reviewers' suggestions of additional research topics, plus a summary of issues raised during the international teleconferences; and
- A statement of problem areas that are candidates for future research, based on the ten major issues identified during our four meetings

The essays in the present collection should not be viewed as sequential chapters in a book. Each stands alone as a statement regarding a particular issue facing libraries in the 1990s. The issues identified are not exclusively "library problems." They are problems facing educators, government leaders at every level, and the citizens who use library services. The content is of great interest and concern to any library professional, but should be equally informative to those concerned with such basic social issues as literacy, effective and appropriate use of public resources, accessibility of information to all segments of society, preservation of our cultural heritage, and continuing education in a period of intense technological and social change.

The authors of these essays have viewed their topics from disparate perspectives. Some have presented their theses in the context of the library's historical role; some have focused heavily on prior research; and some have concentrated on technological innovation with all its challenges and opportunities. All have questioned the changing role of library and information professionals and have considered in some fashion the social mission of the library, the flow of information through society, changing user needs and requirements for user education and training, and the economics of information.

In their challenging essay, the initial offering in this collection, Louis Vagianos and Barry Lesser identify and define the nature of emerging information policy issues and attempt to position the library within the larger policy context of the changing information marketplace. The library as a social institution is experiencing increased demand for information resources and user services, but it is also facing new competition, proliferating materials, rising costs, revised requirements for professional training, new demands for networking, and altered fee structures. The role of the library is changing. The day of the standalone depository has passed, but what new form(s) will the library take? Much of the success or failure of the library as an institution will depend on the larger social environment, and on public policy issues at every level of government.

Vagianos and Lesser suggest that a first step must be an in-depth review of information law, legislation, regulations, functions, and agencies of government at the federal, state, and local levels. An appropriate definition of the information sector is needed, as are methods for measuring its size and performance. Among policy issues that must be considered are education -- "the single most important activity of society" -- as technology changes the educational requirements of our citizens and makes flexibility and adaptation to change a fact of their working lives; access -- "of fundamental importance to maintaining equality of opportunity and preserving a free and open democratic society" -- as the growing treatment of information as a commodity threatens equal access both in economic and social terms; the role of the government as information producer and distributor, raising questions of competition with the private sector, the legitimacy of private firms profiting from the marketing of government information, and the appropriateness of citizens paying to receive government-produced information generated from tax dollars; national security, as the global information marketplace becomes big business; information control, including privacy issues and property rights; and cultural issues, primarily the question of cultural sovereignty and the related possibility of removal of the artifacts of a nation's culture, in the form of information records, to other countries.

Focusing on the education and training of librarians, Robert Hayes notes a recent dramatic change in library education: "For the first time in its historical development, there was not a growth in the number of programs, but a dramatic reduction in them. In addition, the fundamental nature of many programs has also changed, with a shift from a focus on librarianship to the inclusion of a wide range of information-oriented curricula -- to meet the needs of a far wider range of employers and operational contexts."

While his emphasis is on formal degree programs, Hayes also explores on-the-job staff development, commercial training programs, and continuing education as relevant forms of education for librarianship. How should formal degree programs be structured to fit the increasing importance of information in our society? If students are prepared to deal with policy issues and questions arising in the information age, a substantial additional burden is placed on library school curricula, as well as an additional expense for hardware. Should changing demographic and cultural patterns change the nature of library studies, and of students and faculty?

Hayes raises questions concerning the contemporary relevance of the traditional core curriculum, the effectiveness of the typical practicum, the appropriateness of the duration of formal degree programs, the number of faculty essential to the success of a program, and the importance of "research productivity" (measured in publications) vs. "contribution to the profession." He asks questions about maintaining and improving the quality of students, about the resources required to achieve and maintain excellent programs, and where they can best be provided. He questions governance, the closeness of the library school to the mission of the institution, and its relationship to other academic programs. Specialization, cross-disciplinary education, research competence, and management training are other issues touched upon in this essay.

Beverly Lynch also explores the education of librarians, noting that first degree programs are preparation for entry-level positions, with specialization following through practice and self-determined continuing education, rather than through internships or other formal programs. Lynch traces the history of education for librarianship from early apprenticeships through Dewey's school at Columbia to other academic programs in technical institutes, public libraries, and universities. The common quality in all early programs was the emphasis on technique, still the primary focus of in-house paraprofessional programs. She contends that the future of librarianship rests on principles common to all specializations in the field, yet suggests that these are poorly understood and articulated, and that vocational issues continue to preoccupy the profession. Leadership is required to address questions of intellectual content and to put vocational requirements in perspective. This is increasingly true, as changing technology and the need for adaptation to new techniques mean that vocational training is less valuable than the intellectual foundations that keep librarians on track about what the library is doing, for whom, how, why, and how well. More attention must be paid to what is taught in Masters-level courses, and the profession must take more seriously the responsibility for educating and training school librarians.

Pat Molholt suggests that access to information, traditionally a matter of finding out that a book or journal article exists, and then where it can be found, will take on an added dimension in the 1990s. Familiar tools of information technology readily reveal the existence and location of materials. The next step is to provide access to contents, via online tables of contents, indices, and structures that will allow the user to move into text to search. The individual needs, sophistication level, and viewpoint of the user must be addressed by providing systems with rich and varied access vocabularies. Artificial intelligence is one tool that can help make such systems available. Molholt relates the creation of systems to organize information for convenient consumption to such conventions as pagination, margins, and punctuation developed to enhance the accessibility of printed materials.

The economics of the information marketplace, and arriving at pricing practices that will be fair to creators, producers, distributors, and users of information are of critical importance, especially if the library is to be a driving force in the creation and distribution of information rather than a passive consumer of it. Information has always been more accessible to those who could pay for it. Libraries need to rethink issues of acquisition vs. access, and how to provide information that is responsive to the actual needs of users. Molholt claims that questions regarding access reveal how closely the library interfaces with computer technology, and point up the need for expanded research that will lead to changes in institutional structures and graduate curricula, as well as in professional philosophies.

Richard Cox and Lynn Cox approach the topic of selecting information for preservation from the differing, but related, perspectives of an archivist and a university library preservation coordinator. In the past decade, libraries have made strides in the development of effective physical treatment and reformatting techniques, in building cooperative networks to share data about preservation, in education in preservation management, and in the acquisition of support and resources for better care of library materials. Still, all these concerns should follow a determination of what should be preserved. The authors consider the challenge of preservation to all information professions, review major preservation efforts and library selection models recently proposed, discuss one source of potential solutions, and identify major research issues.

More information is being lost now than was created and used by entire generations in the past, and more information is being produced than can be used or managed. Librarians must decide which information to save, and how it should be preserved. Concern with the fragility of information is relatively recent, and modern library preservation dates only from the mid-1950s. As recently as a decade ago, the controlling premise was still that all information should be preserved. Only in the late 1980s are librarians coming to recognize what archivists have had to face since the creation of their profession: not all can be saved, and criteria for selection must be developed and adhered to at both national and institutional levels. The situation for libraries is somewhat different from that for archives: most library materials are not unique by nature; libraries must make available information of temporary, as well as permanent, value; and overlaps in collections will probably always exist for the convenience of local constituencies. Despite such inherent differences in their institutional environments, librarians can draw on the experience and guidance of archivists in learning to make the hard choices about what to preserve, and then finding means to accomplish preservation.

Raya Fidel looks at technological developments that have brought quantitative changes in the organization and retrieval of information. Research has tended to bifurcate, being directed either to retrieval of information from online catalogs or to the searching of bibliographic databases. Both types of tools organize information in a manner useful for retrieval. Research should be integrated, with the search process itself the focus, and with results relevant to searching of either online catalogs or bibliographic databases. Indexing and retrieving should be viewed as interrelated processes. A variety of interfaces should be provided, depending on the type of search and level of user experience. An array of user aids to subject access should be tested with actual users. Some will be automated versions of print-form aids, but new ones should also be developed that are applicable only to the online format. (One example would be a natural language interface now being investigated by linguists and computer scientists.) Widespread use of automated systems in libraries provides an excellent environment for research because it facilitates observation and analysis of actual searching behavior, provides data, and presents an ideal setting for studying applications of new technology.

Fidel notes that one vision of the future, predicated on computer technology, assumes that the role of librarians in organizing and retrieving information is diminishing and may eventually disappear. She argues that the role of librarians in assisting patrons to perform online searches has increased, and training is now a major responsibility. Library instruction, reference assistance, and staff experience are essential because patrons need help. There is a need for a variety of formal and informal methods of instruction, tailored to patrons' individual needs. Librarians must acquire expertise in a wide variety of subjects until such time as users achieve independence.

Joan Durrance addresses research in the area of information needs, noting that the past and future challenge is to learn how to identify information needs, and to accommodate service patterns around those needs in a constantly changing environment. Information needs theory has been predominantly descriptive in nature, and clear definitions of its terms and concepts are largely lacking. This accounts in part for the fact that changes in information retrieval systems are almost totally technology-driven. A research bias also seems to have developed, with the focus primarily on sources needed rather than on the behavior of the individuals who need information. This has contributed as well to the failure to develop a theoretical base that could transcend individual studies.

General studies of information seeking behavior have shown that what people do drives their need for information, and Durrance notes that the study of how to get information is to be distinguished from studies of information needs. The emerging body of work shows that the types of information needed vary according to a number of factors, and understanding the difference between "problem environments" and "information environments" will play a key role in predicting information needs. The early research in this area resulted in a somewhat distorted view of information seeking in general as being mission-oriented and documented-centered; current research shows the diversity of information and problem environments.

Many researchers have come to believe that psychological factors may influence a person's motivation to seek information. They are also increasingly interested in gaining knowledge of psychological and other forces, on the premise that people may not be driven totally by the surface desire to obtain information. This broadens the focus of information needs research to include multidisciplinary aspects of the field, with inputs from psychology, sociology, and communications. Studies of user needs have continued to make progress, as have efforts to improve the image of the profession. Durrance discusses the ideal, perceived, and de facto roles of the librarian as an information intermediary and the impact of the "theory-in-use" on information seekers.

Brian Nielsen's essay focuses on "those services typically offered by reference librarians in all types of libraries: answering questions, performing literature searches, teaching the use of the library and of bibliographic tools, and providing advisory services to readers." He refers to two revolutions, the one that occurred in the 1970s with the advent of computing networks designed to support libraries' most labor-intensive operations, and the "new revolution" that began in the 1980s, when the online catalog introduced computing in the public area of the library -- a first step in bringing about a fundamental change in the services libraries offer and the way such services are delivered. Such changes challenge librarians' views of themselves and their profession by redefining their roles as providers of service to users.

Historically, and even now in library school education, emphasis has been on the librarian as question answerer, acting as an intermediary between the user and the desired information. Referring to research in other social sciences, Nielsen suggests that this role has been identified by the library profession as a "core task" -- the one task that offers the public a favorable impression of the profession as a whole (as bedside attention to a patient is the core task of a physician). In attempting to enhance their professional status, librarians have clung to the intermediary role and now feel threatened by the potential for direct user access to information. Teaching and research have been governed by the core task model, and alternative roles have not been adequately considered. Research should examine the actual needs of users, drawing from research in other social sciences on help-seeking behavior. Nielsen speculates that as technology renders the traditional concept of reference service obsolete, new emphasis will be placed on user instruction, and even on providing expertise in design, installation, and use of new information technologies in and beyond libraries.

In his examination of library funding and economics, Yale Braunstein hypothesizes that "output measures such as community perceptions or university ratings . . . are, at least in part, determined by quantitative measures of library services and collections." The latter "are related to budget size, which may in turn be influenced by a variety of political, economic, and social factors."

Introduction

Libraries of every type are traditionally part of a larger body, so that library funding is negotiated with a "parent" organization, with all the politics, economics, and administration implicit in such an arrangement. Braunstein poses a series of questions concerning the relationship between library performance and budget: Is there a general linkage between results achieved and size of future budgets? Is budget an adequate reflection of level of demand for library services? From a systems standpoint, he states, every library has two primary functions: dissemination and repository. The mix varies. Braunstein suggests that the cost of library operations may or may not depend on the mix of outputs and their levels, and he explores the effects of budget size on library outputs. He examines various single-equation and simultaneous-equation formulas for assessing production and cost functions for libraries. Braunstein poses research questions to explore linkages between library outputs and observable measures of system effectiveness for each type of library, tying academic libraries to university ratings, public libraries to community perceptions and literacy, special libraries to organizational profitability and innovation, and school libraries to educational achievement and motivation.

Kenneth J. Rehage of the University of Chicago, Secretary-Treasurer of the National Society for the Study of Education, read these essays at the manuscript stage. He commented: "Issues presented in this material are ones that I have encountered as an 'end user,' to borrow a term that occurs frequently in the manuscripts. This material has helped me to see the library and its problems in a different way, and for that perhaps both the library and I should be grateful."

It is our hope that other readers will share this experience, and will take from these essays a new perception of the library, its problems, and its promise for the future.

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INFORMATION POLICY ISSUES: PUTTING LIBRARY POLICY IN CONTEXT

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Abstract

In today's climate of technology-driven change in the information marketplace, the library -- society's traditional institution for gathering, organizing, and transferring information on behalf of the general public -- stands in a tenuous position. On one hand, the increased importance of information has enhanced the library's societal role; on the other hand, the increased value of information has introduced a growing number of competitors, new requirements, and unanticipated pressures which have seriously reduced its ability to function. Sound information policy must be developed to help reduce the conflicts inherent in these new realities. This paper attempts to identify and define the nature of information policy issues emerging from our rapidly growing information society, and to position the library within this larger policy context.

Introduction

The information marketplace is in the midst of a period of profound change, a transformation of a scope and scale unseen since the invention of the printing press. This change is technology-driven, transformative in nature, and has fundamentally altered the role of information as a strategic economic resource. Production, distribution, and use of information (types and methods alike) are being affected in all sectors of the economy and all segments of society. Information is being privatized and commercialized in a wide array of new information goods and services. Information is also becoming globalized, under the impetus of advances in telecommunications technology and the creation of global telecommunications networks.

At the same time, the workplace is being revolutionized, in terms of the proportion of the labor force engaged in both the information service sector and the traditional primary and secondary sectors. Over 35 percent of manufacturing sector employment is now in information-based occupations.[1] Robotics, "smart" machines, and expert systems will further increase this proportion in the next decade. In short, the evolving information marketplace is having a pervasive impact on institutions and organizational structures in education, job location, research, culture, and the process of government.

Amidst this climate of great change, the library finds itself in an increasingly difficult position. On the one hand, the heightened importance of information as a strategic resource and the growth of information goods and services are creating an increased demand for information resources and user services traditionally provided by libraries. On the other hand, libraries as institutions are being subjected to significant pressures from the information revolution: new competition, a proliferation of material, rising costs, revised requirements for professional training, unprecedented networking demands, and altered fee structures -- each with major significance for the future of librarianship.

Libraries are not homogeneous. Public libraries, special libraries, and research libraries are all experiencing these pressures for change in different ways and to different degrees. But all libraries, regardless of type, are being affected in some way. The age of the library as a standalone depository is at an end.[2] The question that remains to be answered is: In what new form or forms will the library ultimately emerge and with what position or role(s) in the information sector?

Easy answers to this question do not exist, but we know two things: how libraries adapt themselves to the changing information environment is of vital consequence to their future; and appropriate adaptation cannot rest solely on internal decisionmaking. Much of their future success or failure will depend on the larger environment of the information marketplace, with its changing products, changing actors, and shifting geographical and content boundaries, and the public policy environment, including all levels of government, federal, state, and local. Each will play a major role in defining the framework for adequate answers.

Most libraries are publicly funded and/or public service institutions,[3] and so are a direct creation of and dependent upon public policy. Information policy, in its broadest sense, will also have significant indirect impact on libraries. For example, policies respecting the privatization of information, the production and dissemination of information by government, trade in services, cultural and political sovereignty, and national security are all complex issues, and each forms only a part of the information policy environment that will influence the future of the library as a social institution.

This paper attempts to identify and define the nature of the information policy issues emerging from the information society and to position the library within this larger policy context. In so doing, it also attempts to prescribe some of the areas where a reconsideration of the functions and operation of the library is required. Finally, it sets out an agenda for research required for information policy overall and library policy in particular to meet the information needs of U.S. citizens in the decades ahead.

The Present Policy Environment

Information policy has no simple definitional boundaries, because it includes responsibility in virtually every area of governance. It involves questions of commerce, education, labor, law, defense, broadcasting and communications, international relations, trade, culture, social services, environment, transportation, financial markets, and government administration itself, making any government policy that involves the creation, distribution, and use of information a part of information policy.[4] This is a broad definition. Indeed it is so broad that it lacks operational significance. But we have made it broad quite purposefully in order to underline the complexity and interdependence of the issues. A narrower definition is possible. For example, a 1985 Australian study[5] defined a national information policy as "the basis for government actions aimed at the creation, promotion, support, or coordination of information services."[6] In turn, information services were defined in the same report as "those services which are based on, or provide access to, a store of records or knowledge."[7] This definition encompasses the library, but it ignores, or leaves out, at least four key elements of the information sector as defined in Porat's pioneering study of the information sector in the United States:[8]

1. The information hardware manufacturing industry;

2. The telecommunications infrastructure;

3. Information jobs and functions that are internal to a corporation or to government and that represent a value-added component in the production of a good or service other than an information service; and

4. Information jobs and functions that relate to the interpretation and analysis of records and knowledge or the skills and means of interpretation for better justification analysis.

From a policy perspective, these elements cannot be ignored. Issues such as hardware capability, standards and compatibility, networking, education and training, productivity, and use, to name just a few, cannot be divorced from information services per se. To treat information policy too narrowly does not help put library policies in a useful context, nor does it solve the problem inherent in the complexity of the issues involved; it simply serves to obscure that complexity.

Having opted for a broad definition of information policy, it is beyond the scope of this paper to describe in detail the present information policy environment in the United States, especially if all three levels of government -- federal, state, and local -- are included (as indeed they must be).[9] Reviews of policy developments respecting libraries are already available but tend to focus only on policy and legislative developments with direct impact on libraries.[10] They do not connect libraries properly within the larger information policy environment in any systematic or comprehensive manner.

Given our contention that information policy is a pervasive concern of all branches and levels of government, two conclusions emerge:

1. There is an immediate and compelling need to find an appropriate official definition of the information sector and appropriate methods for measuring the size and performance of this sector. Neither the definition nor the measures exist at present;[11] and they are essential inputs to an appropriate evaluation of the current state of information policy and prospective changes in policy. (In this regard, the Standard Industrial Classification system in the United States is woefully out of date and does not provide

adequate measures of high-technology industry in general, let alone the information industry specifically.)

2. There is a need for an in-depth review of information law, legislation, regulations, functions, and agencies of government at all levels. To know where we want to be and how to get there, we must know where we are starting.

In both of these cases, we must also bear in mind that other policy measures of government, ones that do not fall within the definition of information policy, nonetheless may have significant impact on the information sector. A striking example is provided by the 1985 Gramm-Rudman-Hollings Amendment regarding elimination of the federal deficit by 1991. This Act provides for automatic cuts if deficit targets are not met, while exempting from such cuts 73 percent of the budget as of 1985. Library and education programs are part of the remaining 27 percent that must bear the entire burden of adjustment.[12] Clearly such developments as this must also be monitored and taken into account, even though they do not represent "information policy" directly.

Despite the fact that we do not yet have adequate definitions or measures of the information sector or an inventory of existing information policy for all levels of government, some of the forces that are reshaping the information and library environment can be examined, and some of the major policy issues unfolding for libraries can be identified.

The Changing Information and Library Environment

The forces that are reshaping the information environment subject the library, as an integral component of this environment, to pressures for change both from within and from without. The two most obvious factors intensifying the requirement for fundamental and rapid change, namely, technological advances and new applications of extant technology, deserve serious attention.[13] Technological advances and new applications should not, however, be permitted to obscure non-technological aspects of environmental change. Non-technological causes of institutional change are also environmental constraints that deserve careful exploration, because they shape outcomes significantly and often involve the careful integration of technological and non-technological factors in the search for possible solutions.

Focus on technological trends alone will, therefore, be entirely too narrow. These trends must be set in the context of how the information/library environment is developing. Since this wider setting underlies the issues agenda for public policy in the new information age, a brief discussion of some of the forces reshaping the information/library environment is needed before we can properly identify and discuss policy issues.

Technological Trends

Advances in computer and communications technology (and microelectronic technology more generally) are a central force reshaping the information environment. Computers provide an exponential increase in the storage, processing, and retrieval capability of information systems. Communication via computers eliminates time and space as constraints on the accessibility of information;[14] information can be located anywhere, used anywhere, and used at any time.

For libraries, these technological developments have a number of implications:

1. The number of media in which information is produced (and hence needs to be acquired) is multiplying.
2. The ability to maintain a standalone depository capable of meeting all users' needs is decreasing.[15]
3. Machines have added a new cost center to library operations.
4. Traditional library functions such as ordering, cataloging, and circulation are changing in character, with respect to both the required level of personal intervention by library staff and the necessity for users to physically visit the library to use these services.
5. Collection building and maintenance (particularly in specific subject areas, such as financial services) and reference work (which is dependent on machine databases) are being made redundant.
6. New forms of competition for the library are emerging.[16]
7. Reliance on external information sources is increasing.
8. Technological convergence is creating or fostering institutional convergence -- parts of the library are becoming technically indistinguishable from other information service providers (such as computer centers, instructional communication agencies, and book vendors), while, from a service perspective, many of its functions are in danger of being bypassed.
9. Computer-based information is a highly transient medium -- content can be changed easily, inexpensively, and at will, rendering the ability to maintain the library function of preservation of the cultural record much more difficult.[17]

Commoditization

Information increasingly is being treated as a commodity. This means, among other things, that the price attached to information is rising. This is true for all information goods and services. As a result, rising costs of materials in libraries, in conjunction with their proliferation, have seriously impaired the ability of libraries to maintain comprehensive collections.[18]

In addition, the growing commoditization of information is changing the character of information services. Value-added services, in which the packaging or manipulation of the information provides a justification for an additional charge, are becoming more common.[19] This has at least two implications for libraries:

1. Insofar as libraries make use of these services, their own cost of operation rises.

2. In an effort to recover at least part of these increased costs, many libraries are instituting user fees to cover the incremental cost of online services; for some library users, this introduces a price barrier to access to the full range of library services.[20] (In introducing fees for online services and interlibrary loans, the library is a part of this commoditization trend, and one wonders if the role of the library as a social institution is being impaired by this action.)

In general, though, the growing commoditization of information raises several important questions about the value of information and its price. Information that cannot command a large enough market to make it commercially viable to offer may fail to be disseminated and, ultimately, to be produced.[21] Information that is paid for is expected to have value for the buyer. Should this mean that the value of information is to be determined only by such a market criterion? Where price is concerned, who is being excluded on the basis of ability to pay, and what are the implications of such exclusion?

Competition

The related forces of technology and commoditization are fostering a significant growth in private, computer-communications-based information services. At the same time that libraries use these services to enhance their own service offerings to users, the new services also represent a source of competition for libraries. This raises questions about the survival of the library and its ability to meet this competition.

The survival argument revolves around the technical possibility that new services can be accessed not only by libraries but also directly by users. If the library introduces user fees to cover the direct charges of accessing these services, so that there is no cost difference between direct user access and using the library as an intermediary, then user bypass also becomes an economic possibility.[22]

The ability of the libraries to meet this new competition is also in question. Libraries typically are publicly subsidized institutions. To mount their own electronic services in direct competition with private vendors makes them subject to charges of cross-subsidization and unfair competition.[23] Worse still, to price library services at going market rates makes the library indistinguishable from the private vendors and disenfranchises that (significant) part of the library user constituency that cannot afford to pay the going market rate.

The same arguments arise when the library acts as an intermediary in providing access to private market services. Apart from the bypass incentive, if the full cost of access is passed on to the user, the same disenfranchisement of part of the library constituency will occur. Less than full access-cost pricing, however, will not only increase library costs but, potentially, distort the market, causing many buyers who are not part of the normal library constituency, such as businesses, to switch to the library, further exacerbating the cost implications for the library.[24]

Convergence

Computer and communications technologies are converging. Parallel to this technological convergence, there is also a functional convergence taking place within the information marketplace among information creators, publishers, and distributors. Self-publishing is increasing.[25] Where traditional publishers are being used, part of the role performed by the publisher is being shifted back to the author -- manuscripts increasingly are required in machine-readable form, and the cost of final manuscript preparation is being shifted back to the author.[26] Direct-to-user sales are increasing, both through the medium of direct mail and through electronic database services.[27] The rise of electronic database services is combining information compilation and processing, publishing, and primary distribution all in the hands of the database vendor.

From the user perspective, a different pressure for convergence is emerging. The range of information services -- electronic database services, computing, and transaction services (shopping, banking, etc.) -- coupled with the diversity of sources in terms both of suppliers and geographic location is creating pressure for single-entry access.[28] The technology to satisfy this need through distributed networking or gateway services is available.

Within this framework of convergence, where does the library fit? At the more micro level, the changes in marketing and distribution channels are creating new problems in acquisition, collections, cataloging and reference. At the macro level, the impact may be far more important. Here the issue is whether the library, as currently organized, is in danger of being squeezed out of the picture. The library does not provide the single-entry access point that users increasingly seek, although it has the potential to do so; and the proliferation of channels for marketing and distribution enhances the potential for library bypass noted earlier. The library must reinsert itself into the mainstream of information sector development or it is in danger of becoming a residual element of the information sector.[29]

Networking

Information is becoming an increasingly impermanent interactive phenomenon, and this raises important issues regarding the public interest in maintaining the cultural record, a function in which libraries traditionally have played the lead role. This relates in part to the capability of the computer, which allows information to be more easily and inexpensively altered, repackaged, reprocessed, deleted, etc., but also to networking, which is making electronic communication a primary feature of the modern information environment.

Libraries have been in the forefront of networking initiatives, but these developments have been, in general, internal to the library establishment.[30] They have not involved access possibilities at either the production or the consumption end of the information marketplace. Insofar as libraries have become major users of online bibliographic and index services, it has been largely in a passive role, reacting to users' requests and passing on the results without screening or interpretation. Of particular noteworthiness is the fact that most libraries continue to operate primarily on the basis of the on-site presence of users. Electronic networking between the library and the user is not yet a widespread practice.

Since networking increases the range of contacts and information sources that the individual user can access independently, for those using such systems the library function becomes less crucial and, in the extreme, redundant.

Globalization

At the international level, networking is turning information into a global phenomenon. This has several implications:

1. It adds to the volume of information to which users expect access.
2. It adds to the cost of information search and retrieval.
3. It gives rise to concerns regarding the availability and accessibility of domestic or local information.
4. It poses the threat of a loss of cultural sovereignty for some countries.
5. It creates the technical possibility of relocation of information storage offshore, with potential implications for political sovereignty, employment, and income.[31]
6. It presents major questions regarding the possibility, and the terms, of access by foreign nationals.
7. It accentuates long-standing concerns regarding the relationship between open information flows and national security interests.
8. It presents new concerns regarding individual rights of privacy and the confidentiality of personal records -- concerns which the growth of computer-communications-based information systems is already making more significant.[32]

Again, the library's position vis-a-vis this trend is tenuous. First, in such an environment, single depository resources come to be less satisfactory. Second, the cost of international search and retrieval activities typically will be higher than for the domestic equivalent. Third, the international marketplace has tremendous commercial potential and is one that the private information industry wants to have for itself.[33] Fourth, the library's general commitment to open access,[34] when extended to the international arena, is in potential conflict with economic considerations and with cultural and national security considerations, with access to foreign databases equally constrained by similar considerations in other countries. Fifth, barriers of both a policy and non-policy nature currently impede international information exchange, but more so at the official institutional level than for the individual. The library as an institution thus has greater problems than individuals, increasing once again the bypass possibility.

Professionalism

A new type of information professional, whose primary orientation is client service, is being born out of all these various forces of change. The new professional must have the skills and abilities to handle the increasing complexity of the information environment and its increasing technological bias.[35] This description does not fit enough professional librarians; nor does it reflect the professional training bias of many of the nation's library schools.[36] The information professional needed will not be confined to working within the library system. In fact, the library faces major competition for qualified workers from other arms of the information industry, from corporate users, and from self-employment consulting opportunities.

Despite the preceding discussion of the potential for user bypass of libraries, it is also true that users are likely to require more, not less, in the way of intermediary services to realize the maximum possible benefit from the changing information environment at the least possible cost. But the required services may not necessarily include, as a primary consideration, the depository and other collections-related functions of the library. This fact was acknowledged in Alliance for Excellence,[37] the 1984 response of the library community to A Nation At Risk,[38] when it was argued:

> ". . . the library must play a central role as a learning center staffed with user-oriented professionals[39] [underlined for emphasis] . . . . How effective lifelong learning is in a library setting will depend on how knowledgeable, supportive, current, imaginative, and committed the librarians working directly with patrons are."[40]

Or, as Lewis Branscomb has stated:

> ". . . libraries must again become teachers and innovators, and not custodians, lest the treasures in their custody become obsoleted by alternative services that fail to serve humanity as imaginatively and profoundly as they could."[41]

Policy Issues: Positioning Libraries for the Future

With this brief overview of some of the more salient characteristics of the new information environment in mind, including the identification of some key problems that will influence the continued viability of the library as the primary institution for collecting, organizing, and disseminating information in the future, we turn now to consider some of the major public policy issues that emanate from the foregoing discussion. The purpose is twofold: to demonstrate that there is a vital and central role for the library in the future, but only if the policy agenda is right and libraries can adapt in the appropriate way; and to address the public policy issues that must form the core of any policy and research agenda dealing with the information environment. We will deal with them in their order of importance.

Education

Education is the single most important activity of society. From the time of Plato's Republic, the objective of education has been to reform, control, propagate, and improve the social, economic, and political aspirations of the state by harnessing the talents of its most important renewable resource, its citizens. At present, the educational requirements of society are changing dramatically as a result of the technological trends underway. It is beyond the scope of this paper to deal in detail with those trends or to offer a general critique. Our concern must focus on more specific problems that affect the library and information environment.

In all cases, though, the role of our educators is to produce responsible citizens who can think and learn; men and women who have been prepared with more than tailor-made skills for a ready-made society, men and women who can cope with the ever-changing contemporary environment. Education, then, is concerned with knowledge (acquiring, analyzing, exploring, and expanding it); and it is about training (learning how to use knowledge to live and prosper in our dynamic world). Central to gaining, understanding, and using knowledge is information.

As information increases in significance as a strategic resource and a productive sector of the economy, it will be important for all citizens to acquire the new skills needed to function both at work and in their daily lives. This must include acquiring the competence to find and properly use information resources.[42] Similarly, as information-based activities become dominant in the economy, it will be necessary to equip workers with the skills called for, to retrain existing workers who find their jobs changing or who, voluntarily or otherwise, are forced to change jobs. Moreover, research and development activity is an integral part of the process of arriving at knowledge and is essential to building and maintaining a strong competitive advantage for the United States in information goods and services. To be efficient, research and development activity must build on the educational infrastructure, both to train research and development workers and to help to forge the necessary links between the basic and applied research sectors.[43]

At present, our information-driven age is creating a need for very specific vocational training programs, and at the same time it is influencing the need for a general education that will give people the ability to cope with both career changes and the more general climate of social change that now surrounds us. It is estimated that the average worker now starting out in the labor force will undergo three or four distinct career changes over his or her working life.[44] This calls not only for a general education that will give the required flexibility but also for greater emphasis on continuing adult education or lifelong learning.[45] This implies both program change and organizational change within the public education sector, as well as the imaginative use of technology to provide alternative delivery channels to bring educational courseware to the home and workplace. It also implies a possible need to reevaluate the educational functions of the public versus the private sector.[46] To make the general problem even worse, the primary education audience is shifting from a youth population to an adult population.

Technology is already having an impact on the structure of the education system, but not in a way that fits within a coherent, integrated framework. New competition from business is already present, albeit on a small scale.[47] Remote delivery education is a growing phenomenon but, to a large degree, is being treated as an add-on to the traditional system; it is not, for the most part, being treated as an element of a larger reorganization and reorientation of that system.[48] In part, this reflects existing institutional parochialism; but it also reflects a relative lack of understanding of the changes required and, certainly, a lack of consensus on the need for change.

Education is an important area of public policy. Government, by virtue of both the public good characteristics of education[49] and the level of public funding for education, necessarily must play a major role in planning and reshaping the educational system to serve the changing needs of the economy and society. Government is concerned about education both in terms of quality and in terms of cost. Within the traditional education structure, these two concerns may be in conflict. Technology has the potential of providing a solution to this conflict within a reorganized education structure.[50]

The role of the public sector in the education system, at least beyond the primary and secondary educational levels, is also a major policy question, especially with regard to fees.[51] For example: Does the growing need for lifelong learning carry with it a responsibility for government to pay for these services with tax dollars? There is a case to be made, on efficiency grounds, for the individual to pay more, if not all, of the cost of such education. This may, however, have serious equity implications. This is a crucial public policy issue that must be placed high on the policy agenda for consideration. There is a need to find a compromise between these two concerns.

Within the education system, libraries have a role of renewed importance. Integration of the library into the education system is one of the areas of convergence of the library referred to earlier.[52] There is a role to be played in the teaching and learning of information skills -- that is, how to find and use information. What is ironic is that this role was always there; it has just been intensified by the new technology. Since many people have not learned how to use the existing system, new methods must be found to teach users how to use the system of the future. Beyond teaching information skills, the library professional has the important role of intermediary to perform -- one whose primary function is the screening and interpretation of information resources.

Among many library research projects that spring from the educational issues and should form a part of the research agenda for libraries are the following:

1. An investigation of the issue of training in information skills as a core element of the school curriculum, and the role of the school and public library in this training. Without effective training in information skills, neither libraries nor the wider apparatus of information processing and delivery will be used efficiently by those who most need them.

2. A critical review of library and information science training and education programs. We need to evaluate the degree to which the profession is being equipped with the tools it needs to function effectively in its changed environment, and to highlight areas of excellence in curriculum and resources so that they can be

25

shared and made part of the evaluative criteria of accrediting bodies.

3. An investigation of the changing retraining requirements for library professionals. Model curricula must be devised, and pertinent forms of industry-education and practitioner-student interaction must be implemented, to avoid "missing a moving target."

Other, perhaps more fundamental, research projects that could be included in this list, such as technological and functional illiteracy, will be discussed in the next section, which deals with access. The library as an agent for social change, yet another basic issue, will be discussed briefly in a later section.

Access (Information and Opportunities)

In an information society, access to information becomes of fundamental importance to maintaining equality of opportunity and preserving a free and open democratic society.[53] The growing commoditization of information, however, threatens to erect economic barriers to access, as do the capital requirements for the technology increasingly necessary to access information.

Education in information skills and machine operation represent different kinds of barriers, which are, however, no less real. Talk of the "information rich" and "information poor" is becoming almost a cliche[54] but is a paramount concern for a country dominated by information-intensive activities.

A different type of access question exists on the producer side of the marketplace. Here the issue is one of potential barriers to creators of information in terms of their ability to make their products available to the public. This is partly a question of access to the telecommunications network for distribution purposes. It is also a question of the level of competition that exists in the services market and the potential for a small number of large producers (publishers) to dominate. In other words, the issue is one of market structure, at both the service provider and carrier levels of the market.[55] Related to this is a convergence of content and carriage in technological terms, which is putting pressure on the traditional separation of common carriage and content control.[56]

A third access question arises on the labor market side: namely, the accessibility of jobs to various segments of the population and/or various regions or areas of the country. This is clearly tied in part to the preceding argument regarding education and the question of "information rich" and "information poor." As a social issue, however, it is more than just an education question.

First, there is already some evidence available to suggest that, in proportional terms, the major source of job growth may be not in high-skill, high-pay professional jobs; rather the major source of job growth will be in low-skill, low-pay service sector positions such as waiters/waitresses, cleaners, etc.[57] This does not argue against the need for education or suggest that policies to ensure an adequate supply of professionals are unnecessary. It does suggest that the labor market may become increasingly bimodal and that the job opportunities created in the information economy will not be of an equal character.[58] As an empirical phenomenon, there is nothing new about a nonequivalence of jobs, but the magnitude of the split in job opportunities now appearing may significantly change the argument.

Second, within the information sector itself, job opportunities are not uniform in character. Information workers are made up of knowledge workers (the creators of information) and data workers (in simplistic terms, the users or processors of information).[59] Data workers perform a variety of jobs at many levels but, more importantly, include all of the lowest skill, routine, clerical type jobs. The knowledge worker group has grown faster than the data worker group in the past decade, but in absolute terms data workers are by far the predominant category within the information workforce.[60] In total numbers, the bulk of jobs will continue to go to the data job group, which includes the "low end" of the information labor force in terms of skills and remuneration. This reinforces the previous conclusion regarding non-information service sector jobs. It also has a further dimension: the technology of modern communications and the growth of global telecommunications networks is making many of these routine low-end jobs more footloose. Such tasks as data input, file maintenance, etc., can now be located literally anywhere, as long as there is a data communications link to maintain management access to the database.[61] As a consequence, many of these jobs may be relocated offshore, i.e., outside the country, where wage rates are lower. Just as automation technology seems to be ending the export of manufacturing jobs, a new export of information jobs may take over.[62]

A third consideration regarding labor markets is the implications for women and for minority labor groups.[63] Both of these groups, proportionately, are more dominant in the non-information services group and the data worker group, making them more vulnerable to the labor market changes and disruptions referred to above. They are also the groups most likely to be affected by the access problems on the user side of the market, discussed at the beginning of this section.

Finally, there is a major question that arises regarding technological displacement of workers. As manufacturing activity continues to automate and productivity increases, the growth in jobs in the non-information labor market will fall. This has been the case for well over a decade. In many cases, displaced workers will not have the skills or training to fill information sector jobs. Some, especially those workers in the older age groups, may not be retrainable. There is still considerable disagreement as to whether there will be net displacement of workers on balance as a result of technological change,[64] but there is no uncertainty that the structural change in the labor market will cause individual displacement. Thus there is a need for retraining programs and for consideration of how society is to deal with the problem of the permanently displaced.

There are a number of other issues involving access which have policy implications: intellectual property protection, government production of information, government distribution of information, international information flows, national security concerns, and so on. Some of these are important enough to be treated individually in the discussion below. The major issue, however, is simply stated: the terms of access to information and information sector market opportunities are changing, while at the same time (for both efficiency and equity reasons) there is a greater need than ever to maintain equality of access at least at some minimum level. Achieving this result while still maintaining the economic growth potential

27

of the information sector represents a major challenge to the policymaking community.

In meeting this challenge, libraries can make a positive contribution. First, as previously noted, they have a role to play within the education arena. Second, and most important, libraries are an existing social institution for providing information access. It is maintaining this role as a primary "player" that makes the survival of the library a matter of concern. At the same time, as noted above, the pressures on libraries from the changing information environment do not guarantee this survival without deliberate action to redefine and reaffirm the role of the library within the information sector. Third, the library, as a community center, can serve as an important focal point for dialogue, debate, and understanding of the issues. Finally, the library can play a particular role, both as community center and in its education function, in addressing the concerns of minority groups and the disadvantaged.

Beyond the possible general arenas for research studies introduced in the discussion below, there are a number of necessary library research studies, related to the access question, that form part of the core of a research agenda:

1. An investigation into computer/communications technology implications (with particular emphasis on microcomputer technology) for librarianship, both in terms of a means of facilitating service and as a medium for service. If the new technology is to help librarianship, we must see what its implications are and have some working examples of technological diffusion within the library community, in order to see what policy initiatives are needed in the future. Implicit in this study will be the need to deal with "technological illiteracy" among librarians and users.

2. A critical review of present library programs for minority groups and the disadvantaged. The library should play an increasingly important role in delivering complex and costly high-technology services to these groups.

3. An examination of the implications of user fees for library access. The correct appreciation of this issue is fundamental to the library in planning a worthwhile role in the information system.

4. An investigation of the community educational programs of libraries and the need for change or reorientation. It is becoming apparent, particularly for the adult segment of the community, that community education in the information age is an arena of major consequence that is currently not receiving the attention it deserves.

5. A review of past and present library networking arrangements, in order to determine the unique characteristics of library networks and to examine lessons that can be exchanged between library networks and other forms of networks.

6. An examination of the distinctions among different types of libraries as they may be affected by information technology, both in functional terms and in operational terms. Appropriate variable policy instruments must be devised that will contribute to the realization of desired ends in the most relevant manner.

Government as Information Producer and Distributor

The rise of private market information services, coupled with general budgetary concerns of government at all levels, is calling into question the role of government as a producer and distributor of information. Private market vendors do not want to compete with government. At the same time, they would like to take advantage of the opportunities to distribute government information where it is commercially viable to do so. Government itself wants to promote the private information industry, while trying to reduce the very high cost of information collection and distribution.

These concerns have already led to a number of executive policy changes, largely set down by the General Services Administration.[65] Nevertheless, the issue is far from resolved. From a societal point of view, there are some major policy questions that obviously have not been thoroughly thought through:

1. Whether government information that does not command a large enough market to be viable for a private business to distribute will be lost or become inaccessible;

2. Whether citizens should have to pay to receive government information, the collection of which has already been paid for with tax dollars;

3. Whether private businesses should be able to profit from marketing government information for which they do not pay the full cost in the first place; and

4. Whether there will be an underinvestment in the production of information if it is left entirely to the private market.[66]

The library has been a primary agent in the government's involvement in information distribution both directly, through the medium of depository libraries, and indirectly, through the funding of the public library system to which all three levels of government contribute. Thus, the level of library funding, the role of private business as an intermediary, and associated issues such as the adoption of user fees, arise directly from a reconsideration of government's role as an information producer and distributor.

Two questions that need further study and should be included in the library research agenda are:

1. An examination of the implications for libraries and citizens of the changing policy regarding government (sponsored) production and distribution of information, given the continuing importance

29

of the U.S. government in both production and distribution roles, and the essential value of the information involved.

2. An investigation of the domestic/foreign content expenditures of libraries, to give a better picture of the degree to which the U.S. information system is dependent on (and therefore vulnerable to) external producers. This, in turn, can form the foundation for an enlightened information foreign policy.

National Security

Information and information technology have become not only strategic economic resources but strategic political resources. In fact, these two phenomena are related in that the former, to a large degree, is what is driving a new set of concerns about the latter. Information has always been a strategic political resource. What has changed is its growing economic importance, which is making it an area of increasing political importance.

The national security argument is the traditional method for seeking to deny unfriendly nations the benefits of technological advances and information that can be used by them or against us; in other words, seeking to contain any threat to our own well-being, either relatively or absolutely. For reasons of economic importance, the national security argument is being extended. The global information marketplace has become a very big business. Maximizing the U.S. share of this global market is of major national concern.[67] Thus, new anxieties are arising regarding the possible loss of U.S. competitive advantage due to release of scientific and technical information.[68] (It may also be worth noting that these concerns may be misplaced. Some of the competitive advantage is being lost because the U.S. industrial structure is not making proper use of the scientific and technical information that the research and development sector generates.)

The quandary in this argument is that, at the same time one wants to protect information and information activity that could undermine U.S. production of information services, one also wants to maintain entry to global markets for the outputs of those services. This places the United States in the somewhat contradictory position of erecting new barriers to the free flow of information and technology at the input level, while arguing forcibly for an open access policy on the output side.[69] This contradiction is compounded by the fact that the same information may be part of both sides of the market, i.e., there are databases, books, etc. that, as outputs of the information sector, contain the information we otherwise seek to deny, to protect our place in the market.

A related issue involving national security has to do with enforceability. Once we move outside the area of classified, sensitive information, the ability to control information flows, given the globalization of networks and the inability to monitor content without infringement of individual privacy laws, is at best limited and ad hoc. To put it another way, even if there is agreement on what should or should not be distributed outside the country, the ability to enforce such regulations may be nonexistent. What this means, in practical terms, is that technology may have made policy barriers to transborder access trivial.

This is, of course, a problem that reaches well beyond the specific issue of national security. It has potential implications for the balance of payments, for tax compliance, for monitoring of financial flows, and so on. The solution to the problem is not obvious, but the issue clearly needs to be considered.

For libraries, the national security argument matters because of the library's primary dedication to the principle of unrestricted information flows and the fact that libraries are increasingly networking on a global basis and, hence, are becoming one of the institutions potentially subject to control.

Along these lines, two issues are worth exploring:

1. An examination of future library networking potential, both internal to the library system and with respect to external links to producers and users. Such an examination should include a primary focus on economic considerations and service to users, with an emphasis on how these will facilitate future technological accommodation in libraries. It should also include a review of international library networking problems and their potential, as a result of the increasing internationalization of scientific and scholarly inquiry, and because of the increasingly global scale of problems and projects for their solution.

2. An examination of how extensive the revised role of the library should be in the preservation and organization of the cultural record, at the national, state and community levels, inasmuch as this is a perfect test case of an area where there is undeniable value added, but where quantification and evaluation are difficult, perhaps even impossible. Since this information is not currently subject to government control, and is available to most users, some quantification of its value must be attempted. This could have profoundly valuable effects in many areas of policy research.

Information Control: Privacy Issues and Property Rights

Information technology makes possible, from a technical perspective, either a greater centralization or a greater decentralization of information-based activities, both in hierarchical organization terms and in geographic or spatial terms. The technology itself is neutral; other locational factors will determine the outcome.[70]

The same argument applies to the control of information. Over the next decade, it is likely that we will see an increased centralization of control; i.e., the production, storage, and distribution of information will be controlled by fewer bodies, both within the country and between countries. This, if true, is not a desirable trend.[71]

There is another dimension to control -- the increased potential offered by the technology for invasion of personal privacy through the use or misuse of the profiles of individuals being amassed by computer systems across the country, and indeed around the world.[72] This problem may exist even for a single database, but it clearly is magnified when we introduce the possibility of cross-referencing several databases and constructing a cumulative profile. In an information society data become money. This is part of what is happening. Information on individuals -- what they buy, where they but it, their credit performance, their reading habits, etc. -- can be extremely valuable in an age of target marketing. Businesses or other organizations that possess this information for quite legitimate reasons are discovering that they can earn a profit by selling it. Should this be allowed? Who, in fact, should own such information -- the database operator or the individual to whom the information pertains? In many respects, the question at issue is one of property rights.

Two corollary concerns to the privacy issue are accuracy and security. What are the rights of the individual with respect to knowing what files exist on him or her and in being able to ensure that such files are accurate?[73] What can be done to ensure the security of information systems, in particular computerized systems, so as to prevent abuse of files?[74] In addition, the security issue is a much larger problem in that it relates to the security of business files in general and the problem of computer crime.

The property rights question also has a larger dimension -- the protection of intellectual property rights.[75] The problem here is of three dimensions: the adequacy of existing protections for intellectual property with respect to new forms of information (software, electronic databases); the erosion of traditional protections in the face of easy and cheap copying technology and the ease of modifying computerized information; and the conflict between vestment of property rights in the creator or processor of information and the societal interest in more open access to information. The first two dimensions pose an enforceability problem. More importantly, the first two dimensions are in conflict with the third. In an age where information becomes the dominant economic and social force in society, access rights assume major significance. In an age where information as a private good represents the major source of new wealth and economic growth, a system that provides proper incentives to information producers assumes equal significance. Striking a balance between the two will not be an easy accomplishment.

It must be recognized that these issues of control and ownership are not simply internal concerns; they have a very important international dimension. This has already been touched on in the discussion of national security and transborder access issues. It is also an important dimension of the information control question, recognizing that control may gravitate to a point outside the country. It is clearly an important dimension of the intellectual property protection issue, especially given the growing importance of the global information market. International cooperation is becoming a sine qua non for effective policy response to many of these questions.[76]

For the library, these control and ownership issues have obvious implications. Libraries are in the thick of the debate on intellectual property protection and the doctrine of "fair use" as laid down in the 1976 amendments to the copyright laws.[77] Libraries are the holders of personal information files on patrons, the confidentiality of which is a question that cannot be ignored.[78] Libraries are, at present, a decentralized set of information depositories. What will be the implications of an increased centralization of library holdings, a move that may be economically efficient but that may remove or eliminate local control in the selection of information resources?

Two obvious library research studies, then, should involve the following:

1. An examination of the relative merits of centralization of library holdings, including an investigation of the issue of confidentiality of library user records. Such an examination can make use of the extensive professional experience libraries have gathered over three decades of experimentation with centralized holdings, can try to gauge properly the dangers involved in abuse of user records, and can look at how future technological developments will affect both trends.

2. An examination of the library's position or interest in the debate on intellectual property protections. This is particularly noteworthy because the library has been in the forefront of case law development in copyright and intellectual property, and has at the same time developed an extensive body of carefully considered policy that is readily accessible and assessable.

Cultural Issues

The issue of cultural sovereignty is recognized as a major concern for many countries,[79] but it has not been regarded as particularly important by the United States from a domestic perspective; i.e., the United States, at least in the Executive Branch of the federal government, is not particularly concerned about the swamping of U.S. culture by foreign-produced or controlled information services and products.[80] Given that it is U.S. dominance that most worries other countries in this regard, this is not a surprising position. There are, however, domestic concerns that do need to be addressed, if only because the United States cannot assume that its present dominance will not be eroded over time.[81] Beyond this, however, the United States is susceptible, just as other countries are, to the removal of the artifacts of its culture -- its information records -- to offshore locations, which their conversion to an electronic format makes more possible. It needs also to be concerned about the relocation of artistic production, as the information age makes these activities increasingly footloose. An erosion of the economic base of artistic production, especially television and film, ultimately will erode the artistic base of the country. Nonetheless, it is true that the size of the U.S. cultural market, and its present dominance on a global basis, make these concerns less pressing than for many other countries.

It is the concern over cultural sovereignty by other countries that is of immediate concern to the United States. Actions by other countries to protect cultural industries could have severe implications for the U.S. information industry in the global marketplace.[82] The outcome of the current round of GATT negotiations, which will deal with trade in services, will be of major significance to the future of this concern.[83]

A different cultural concern is being created by the growing use of computer-communications technology for the production, dissemination, and storage of information -- the preservation of the cultural record.[84] It has long been an accepted function of the state to maintain the cultural record of the country as that which is reflected in printed works and other media. This function has, however, been put under strain due to the explosion of information output -- which has both created a physical storage problem and added significantly to the cost of acquisition and preservation -- and by the proliferation of alternative media.[85]

Computer-communications technology introduces a new problem, even as it provides a solution to the physical storage problem, without any necessary diminution of access, and promises a solution to the problem of alternative media.[86] The new problem is that computerization and the accompanying trend of information commoditization create the following difficulties:

1. They make information products more transient. Products are maintained on databases only as long as they remain commercially viable for the vendor, whereas a book, once printed, is always there.[87]

2. They create uncertainty as to the point in time at which a computer-based information product is to be treated as a final product, i.e., one that is archivable. This is a function of the ease with which computer-based information can be altered. Indeed, the ability to update computer information files to provide currency has become a major selling feature for certain databases.[88]

3. The transiency of computer-based information is also likely to mean that more "trivial" information will be produced, information that will not be worthy of preservation. The problem with this is that someone will have to decide what is worth keeping. That type of authority is open to abuse.[89]

For libraries, these cultural issues have obvious significance. Libraries are, in many respects, cultural institutions. Libraries at all levels, from the Library of Congress down to the smallest community library, play an indispensable role in the function of the state as preserver of the cultural record. Libraries have a major interest in open access or the free flow of information. They also have an interest in the promotion of domestic information resources. The library will be affected by official policy regarding transborder information flows both in the United States and in other countries. It also has to deal with the question internally, however, in such ways as deciding on the balance between domestic and foreign product acquisition, providing a capability to access non-English databases from other countries, etc.[90]

Within the foregoing context, two major library research studies merit serious attention:

1. An examination of the role of libraries and librarians as agents of social change. This is especially significant when the scope of social change implicit in the information revolution is properly appreciated. If libraries and librarians themselves can adapt competently to such major change, they will serve as valuable role models to the wider community, as well as serving as a conduit whereby wider change is realized.

2. An inventory of information law, legislation, regulations, functions, and agencies of government at the federal, state, and local levels. Such an inventory could be used to identify areas where legislation is producing counterproductive results, to indicate which aspects of the regulatory apparatus need overhaul and updating, and to isolate positive examples of effective regulatory policy that can be extended and emulated.

Developing an Information Policy

This has not been an exhaustive discussion of information policy issues. Nor has it been a definitive or "best" list of library research projects. It has, however, treated some of the most important questions. More significantly, it has demonstrated the complexity of information policy and the interdependence of the issues, an interdependence that results from the trends of commoditization, globalization, and convergence. It has shown that library policy cannot be developed in a vacuum; for the library to flourish it must be seen as part of a coherent, integrated information infrastructure and policy environment.

In presenting issues, we have not presented solutions. Precisely because of the growing complexity of information policy, solutions are not easy. What is needed, however, is a framework or forum for approaching the issues and beginning the search for solutions. This is an unambiguous prescription or recommendation for government policy -- to set in place this framework to provide a mechanism for informed debate that seeks to define the role of the public sector in the information age and that involves all facets of society with an interest in the outcome.

The completion of one task could go a long way in expediting this process -- namely, the development of measures of the information sector, including elements, size, economic value, and performance criteria. Without such effective measures, it will be impossible either to devise effective policies based on real conditions or to have any confidence, based on pertinent evidence, that specific policies are having their intended effects.

Conclusions

As should be obvious to the reader, the potential agenda for research is vast, because the subject matter under investigation encroaches on all aspects of contemporary living. No human being or institution is immune.

One of the recurring themes in this paper has been the notion of adjustment to extraordinary change. Change is not new to our generation. Since the time of the ancient Greeks it has been an environmental constant -- an inevitable fixture of life and a distinguishing characteristic of civilization. What is new to our generation is the ever-increasing speed with which events unfold.

Thanks to technology generally, and information technology in particular, new developments become obsolete and are replaced before we can adjust to or understand their implications. Worse still, the effects of constant change are multiplied by the fact that everything seems connected to everything else and

35

nothing seems possible in isolation. In such an environment no one can predict the range of effects that events or innovations will have.

Although the consequences of accelerated and accelerating change are unpredictable and are proving costly to our society, they can be minimized through good planning. Good planning is a method of thinking out acts beforehand. At its best it is moderated by a clear vision of reality, some general agreement on a probable future, a manageable set of goals, and appropriate action.

Our purpose in this paper is to get at the beginnings of a solid picture of the three major general issues for libraries:

- Institutional adaptation;
- Professional adaptation; and
- The library as social agent.

Together, these three represent the broad questions that must be investigated through research, debate, and dialogue as we seek to plan for the role of the library in the information society, to position the library appropriately within the larger, dynamic information environment, and to position library policy within the context of a national information policy framework. A sustained research initiative is the best way to start the planning process, and it promises to make the difference in deciding whether the library can become a dynamic agent in the creation of a new and better future.

Notes and Bibliography

1. Wolff, E., and Baumol, W. "Growth of the information sector in the postwar U.S. economy: Direct and indirect effects." Paper presented at the Conference on The National Information Infrastructure: The Role of the Public Sector, Croydon, U.K., October 1986. Wolff and Baumol show that the percentage of information workers to total labor force in the "goods producing" sector rose from 25.6% to 34.7% in 1980. In manufacturing, by itself, the percentages went from 28% to 32% for nondurable and durable manufactures, respectively, to 35.8% and 38.2% for the same period of time.

2. See, for example, Lancaster, F. W. Libraries and Librarians in an Age of Electronics. Arlington, Virginia: Information Resources Press, 1982; Thompson, J. The End of Libraries. London: Bingley, 1982; and Bell, D. "The social framework of the information society," in The Microelectronics Revolution, ed. T. Forester, 528-531. Oxford: Basil Blackwell, 1980.

3. Not all libraries receive public funding. Corporate or private libraries are, perhaps, the primary examples of those that do not. Nonpublic school libraries and private university libraries also may not receive public funding. The latter may, however, still perform a public service role, at least within their own student communities. University and college libraries more generally tend to serve the communities in which they reside, as well as their institutions.

Moreover, insofar as the institutions receive public funds, the libraries in such institutions can be regarded as being indirectly funded by government.

4. The 1976 Domestic Council Committee on the Right of Privacy, chaired by Nelson Rockefeller, defined information policy as dealing "with the policies which govern the way information affects our society." U.S. Domestic Council Committee on the Right of Privacy, National Information Policy: Report to the President of the United States, 223. Washington, D.C.: National Commission on Libraries and Information Science, 1976. This notion of a multifaceted information policy has also been expressed by Arthur Bushkin and Jane Yurow, who state: "In the United States, as in other countries, there is no grand information policy, no single information policy, but rather a composite of policies, explicit and implicit, about information." Bushkin, A., and Yurow, J. The Foundations of United States Information Policy, 4. Washington, D.C.: National Telecommunications and Information Administration, 1980.

5. Judge, P. J. National Information Policy. Canberra, Australia: Department of the Parliamentary Library, 1985.

6. Ibid., 99.

7. Ibid., 98.

8. Porat, M. Definition and Measurement, Volume 1 of The Information Economy. Washington, D.C.: U.S. Government Printing Office, 1977.

9. All three levels of government make laws or otherwise enact policies respecting the creation, distribution, and use of information. As all governments are participants, none can be excluded from a comprehensive overview of information policy. Constitutionally, all powers not expressly delegated to the national government or prohibited to the states fall within state responsibility. All local government authority derives from the states, there being no mention of local government in the Constitution. This constitutional division of powers is especially relevant to libraries. It means that federal library policy must have reference to the states. At the state level, responsibility for public libraries may be transferred or, indeed, delegated to local governments or retained at the state level. See Ladenson, A. Library Law and Legislation in the United States. Metuchen, New Jersey: Scarecrow Press, 1982.

10. Ladenson, A. "Law and legislation," in ALA Yearbook of Library and Information Services 1986, 182-185. Chicago: American Library Association, 1986; Cooke, E., and Henderson, C. "Legislation and regulations affecting libraries in 1985," in Bowker Annual of Library and Book Trade Information, 31st ed., 213-223. New York: Bowker, 1986; Milevski, S., and Chartrand, R. L. Information Policy: Legislation of the 95-98th Congresses, with Selected Bills of the 99th Congress. Washington, D.C.: Library of Congress, Congressional Research Service, June 1985; National Commission on Libraries and Information Science. Public Sector/Private Sector Interaction in Providing Information Services, 34-37. Washington, D.C.: U.S. Government Printing Office, 1982; Reynolds, H. "Bibliographic guide to issues of national and international

government information policies," Government Publications Review 11(l) 1984, 1-39.

11. For a partial discussion of the measurement problem see Menou, M. "An overview of social measures of information," Journal of the American Society for Information Science 36(3) 1985, 169-177. This article contains a useful bibliography on measurement issues.

12. Cooke and Henderson, "Legislation," op. cit., 215.

13. For a brief discussion of the technology of the information age see Rubin, M. Information Economics and Policy in the United States, 3-8. Littleton, Colorado: Libraries Unlimited, 1983.

14. Modern communications networks have rendered both time and space increasingly irrelevant as constraints on the accessibility and delivery of information. Networks permit both access and delivery in real time, 24 hours a day, on a global scale.

15. See note 2.

16. See, for example, Resnikoff, H. "Libraries and the magnification of mental power," in Crossroads (Library and Information Technology Association, National Conference, 1983), ed. Michael Gorman, 7-8. Chicago: American Library Association, 1984.

17. See, for example, Neavill, G. "Electronic publishing, libraries, and the survival of information," Library Resources and Technical Services 28(1) 1984, 76-89.

18. By one estimate, "most large research libraries cannot afford to buy more than 5-6 percent of the world's published output." Battin, P. "Crossing the border: Librarianship in the information age," The Harvard Librarian, September 1985, 8.

19. For a description of many of these value-added services now in the marketplace, see Chase, L., and Tuttle, P. Information Sources 1986: The Annual Directory of the Information Industry Association. Washington, D.C.: Information Industry Association, 1986.

20. ALA Commission on Freedom and Equality of Access to Information, Report. Chicago: American Library Association, 1986. See also, de Sola Pool, I. "Looking down the road of technological change," in Gorman, Crossroads, op. cit., 20-22.

21. ALA Commission, Report, op. cit. See also, National Commission on Libraries and Information Science, Public Sector, op. cit.; and Atkiss, R. "Federal sector," Government Publications Review 11(5) 1984, 373-378.

22. This point is expressed, although not precisely in these words, in Branscomb, L. M. "Library implications of information technology," in An Information Agenda for the 1980's, ed. Carlton Rochell, 43-53. Chicago: American Library Association, 1981. See also, Sprehe, J. T. "Developing a federal policy on

electronic collection and dissemination of information," Government Publications Review 11(5) 1984, 354.

23. The more general issue of any form of government competition in electronic database services is addressed, inter alia, in National Commission on Libraries and Information Science, Public Sector, op. cit.; Sprehe, "Federal policy," op. cit., 353-359; and Schiller, A., and Schiller, H. "Who can own what America knows?" The Nation 234(April 17) 1982.

24. Lacy, D. "A postscript to an information agenda for the 80s," in Rochell, Information Agenda, op. cit., 108.

25. Self-publishing becomes a logical extension of desktop publishing on a large scale once the marketing/distribution function of conventional publishers is replaced by a suitable alternative. In the realm of electronic information products, the "utilities," such as The Source and CompuServe, partially serve this function already.

26. See, for example, Osburn, C. "Issues of structure and control in the scholarly communication system," Library Quarterly 54(1) 1984, 83; and Horowitz, I., and Curtis, M. "The impact of the new information technology on scientific and scholarly publishing," Journal of Information Science 4 1982, 87-96.

27. See, for example, Compaine, B. M. "Shifting boundaries in the information marketplace," in Rochell, Information Agenda, op. cit., 67-89.

28. See, for example Lesser, B., and Vagianos, L. Mass Market Computer Communications Services in Canada. Montreal: IRPP, 1985.

29. As stated by Howard Resnikoff: ". . . the question for the library community is whether it wants to participate in shaping these developments." Resnikoff, "Libraries," op. cit., 15.

30. Vagianos, L., and Lesser, B. "The jewel in the temple: University library networks as paradigms for universities," in Libraries and the Search for Academic Excellence. Proceedings of a National Symposium Sponsored by Columbia University and the University of Colorado. Metuchen, New Jersey: Scarecrow Press, forthcoming.

31. The offshore relocation possibility is one whose importance should not be minimized. The information industry could find itself the "victim" of the same cheap-labor-driven experience that marked the manufacturing sector in the 1960s and 1970s. The additional problem of maintaining secure access to foreign-stored databases makes the problem potentially greater in the information sector than it was for manufacturing.

32. There is a large and growing literature on the privacy question. See, inter alia, Burger, R. H., ed. "Privacy, secrecy and national information policy," Library Trends 35(1) 1986; Davis, R. "Information collection and protection: A governmental dilemma," in Information Technology Serving Society, ed. R. Chartrand and J. Morentz. New York: Pergamon Press, 1979; Rubin,

Information Economics, op. cit.; and Aldrich, R. F. Privacy Protection Law in the United States. Washington, D.C.: U.S. Department of Commerce, 1982.

33. The world market for data processing services is now $40 billion dollars. See Anderla, G., and Petrie, J. H. The International Data Market Revisited. Paris: OECD, 1983, 3. And, by one estimate, the entire information processing industry is expected to be a $1 trillion market by 1990. "Reshaping the computer industry," Business Week, 85(July 16) 1984. See also Ganley, O. H., and Ganley, G. D. To Inform or to Control? The New Communications Networks. New York: McGraw-Hill, 1982; and Library of Congress, Congressional Research Service. International Telecommunications and Information Policy: Selected Issues for the 1980s. Report Prepared for the Committee on Foreign Relations, United States Senate. Washington, D.C.: U.S. Government Printing Office, 1983.

34. See ALA Commission, Report, op. cit.; and Surprenant, T. T., and Zande, J. "The developing crisis in information: A librarian's perspective," IFLA Journal 9(3) 1983, 222-229.

35. See for example, ALA Commission, Report, op. cit.; U.S. Department of Education. Alliance for Excellence. Librarians Respond to A Nation At Risk. Washington, D.C.: 1984; Battin, "Crossing the border," op. cit., 10; Neff, R. K. "Merging libraries and computer centres: Manifest destiny or manifestly deranged?" Educom Bulletin 20(4) 1985, 8-16; Nicklein, J. "Will the new technologies kill the public library?" in Gorman, Crossroads, op. cit., 34-40.

36. See, for example, ALA Commission, Report, op. cit.; Berry, J. "Educating the information society," Library Journal 109(November 15) 1984, 2094; Daniel, E. "Educating the academic librarian for a new role as information resources manager," Journal of Academic Librarianship 11(6) 1986, 360-364; Frant, F., and Main, R. "Curriculum 1984: Meeting the needs of the information age," Journal of the American Society for Information Science 37(1) 1986, 12-19.

37. U.S. Deptartment of Education, Alliance for Excellence, op. cit.

38. National Commission on Excellence in Education. A Nation At Risk. Washington, D.C.: U.S. Government Printing Office, 1983.

39. U.S. Department of Education, Alliance for Excellence, op. cit., 5.

40. Ibid., 26-27.

41. Branscomb, "Library implications," op. cit., 53.

42. U.S. Department of Education, Alliance for Excellence, op. cit.; ALA Commission, Report, op. cit., 45-47; British Library, Library and Information Services Council and National Commission on Libraries and Information Science. Information and Productivity, Implications for Education and Training. Report of a Joint UK-US Seminar. London: British Library Research and Development Department, 1985.

43. Vagianos and Lesser, "The jewel in the temple," op. cit.

44. This prediction is one made by a number of commentators on the need for continuing education or lifelong learning. This assertion is not being challenged; yet it gives some reason to pause to consider the following quotation by Goethe, written in 1809: "Nowadays, nothing we learn lasts for the rest of one's life. Our forefathers relied for a whole life span on what they learned in their youth at school; we have to learn it and relearn it every five years, if we are not to be hopelessly out of date" (Daniel, "Educating the academic librarian," op. cit., 364)

45. The recent literature that has emerged on the need for lifelong learning is too voluminous to reference here. Two points, however, should be noted: first, the case for lifelong learning is not only a function of labor market requirements but also of citizenship and lifestyle in an information age; and second, the case for lifelong learning means an opening up of present educational offerings to adult learners and an institutional restructuring of the education system that allows the needs of adult learners to be met.

46. The question of public versus private education is a particularly thorny issue. In part, it relates to the question of pricing (subsidized versus full-cost recovery) and, in part, to control and responsibility. The private sector certainly has a major role to play in providing training in particular skills required of its employees. The public sector also has a major role to play in providing general education accessible to all citizens. Between these two extremes there is a very large grey area. There is, moreover, a distinction to be made between public responsibility and equality of opportunity and the delivery mechanism chosen. In other words, the private sector can still be used to discharge the public responsibility, through, for example, an education voucher system. Technology is further muddying the waters of this private-public sector debate, as it makes new delivery mechanisms possible for education services and, in the process, makes it harder to place geographic boundaries on students, thereby obfuscating the limits on states' responsibilities to provide education.

47. See, for example, Vagianos and Lesser, "The jewel in the temple," op. cit.

48. Some examples of "open universities" are to be found, but even these have not necessarily changed the structure of the educational institution. Certainly the mainstream education arena has, so far, only "experimented" with genuine remote delivery alternatives.

49. The public goods characteristics of education refer to the fact that education produces so-called "externalities" -- benefits that accrue to, in this case, society, over and above those that accrue strictly to the individual. This means, among other things, that if individuals must pay the full cost of education directly (versus indirectly, through tax dollars), they will, on average, underconsume education, judged from the perspective of the optimal level for society.

50. Vagianos and Lesser, "The jewel in the temple," op. cit.

51. See note 46.

52. See, inter alia, U.S. Department of Education, Alliance for Excellence, op. cit.; British Library, Information and Productivity, op. cit.; and Neff, "Merging libraries," op. cit.

53. ALA Commission, Report, op. cit.

54. See, for example, Ibid., 8-9.

55. Ibid., 6-8; and Rubin, Information Economics, op. cit., Chapter 6.

56. Ibid.; see also, Compaine, "Shifting boundaries," op. cit.; and Lacy, "A postscript," op. cit.

57. This hypothesis has not been proven definitively, in part because the major labor market adjustment to the advent of the information economy is still to come. For an example of some of the existing evidence, see Hudson, H. "The growth of the information economy: Regional implications," in The Information Economy: Its Implications for Canada's Industrial Strategy, ed. C. Gotlieb. Ottawa: The Royal Society of Canada, 1984.

58. The unequal character of new job opportunities is illustrated by the phenomenon of deskilling in the labor force. Deskilling refers to the phenomenon of workers, displaced from their current jobs (by technology or for other reasons), who find that they must accept lower-skill (and lower-pay) jobs if they are to remain employed. See, for example, Gordus, J. P., et al., Plant Closings and Economic Dislocation. Kalamazoo, Michigan: Upjohn Institute, 1981; and Bluestone, B., and Harrison, B. The Deindustrialization of America. New York: Basic Books, 1982.

59. For a discussion of the relative growth of "knowledge sector" jobs versus "data workers," see Wolff and Baumol, "Growth of the information sector," op. cit.

60. Ibid.

61. See, for example, Lesser, B. "An overview of protection issues." Paper presented at the Conference on Access: Information Distribution, Efficiency and Protection. Mississauga, Ontario, May 1987.

62. Ibid.

63. As with all the preceding arguments on possible labor market effects of the technology of the information age, the evidence so far is still inconclusive regarding women and minority groups. On the one hand, the nature of information sector jobs clearly creates new employment opportunities. On the other hand, women, for example, are proportionately better represented in the data worker versus knowledge worker sector and thus may continue to be subject to the traditional, nontechnological barriers to advancement characteristic of their labor market position up to now. Moreover, women may be more likely to be negatively influenced by technological displacement of workers. For some evidence on this from U.K. experience, see Shutt, J.,

and Leach, B. "Technical change in the food industry: The impact of the Ishida computer weigher," in Technological Change, Industrial Restructuring and Regional Development, ed. A. Amin and J.B. Goddard, 188-214. London: Allen & Unwin, 1986.

64. Ibid.

65. See, for example, Cooke and Henderson, "Legislation," op. cit., 217-218.

66. The basis for this argument has to do with the public-good properties of information, specifically, the fact that information is a joint-consumption product where one person's consumption of an information good does not diminish the amount of information for others' consumption, and the fact that the possibility of market exclusion for those unwilling or unable to pay for the information is highly imperfect. In such a case, the private market, on its own, will produce less than the optimum quality of information.

67. See, for example, Library of Congress, Congressional Research Service, International Telecommunications, op. cit.

68. This concern is reflected in the increasing practice of restricting the international dissemination of U.S. scientific research, which is supported by the U.S. government, especially the Department of Defense. This policy, in part, is a consequence of the so-called "Bucy Report" in the 1970s. U.S. Department of Defense, Defense Science Task Board on Export of U.S. Technology. An Analysis of Export Control of U.S. Technology -- A DOD Perspective, February 1976. This position was incorporated in federal legislation in the 1979 Export Administration Act.

69. See, for example, Ganley and Ganley, To Inform or to Control, op. cit., 198. See, also, Hayes, R. "Politics and publishing in Washington: Are our needs being met in the 80s," Special Libraries 74(4) 1983, 322-331.

70. Lesser, B., and Hall, P. Telecommunications Services and Regional Development: The Case of Atlantic Canada. Halifax, Nova Scotia: IRPP, 1987.

71. The adage that "information is power" may be a cliche but is nonetheless true, albeit with a qualification. And that is that control of information is power. The greater the centralization or concentration of control of information and its dissemination, the greater the potential for bias or abuse.

72. For a useful discussion of privacy issues see Burger, "Privacy, secrecy," op. cit. See, also, Cawkell, A. E. "Privacy, security and freedom in the information society," Journal of Information Science 4 1982, 3-8; and Rubin, Information Economics, op. cit., Chapter 7. The enhanced problem created by the networking of computers is discussed in Moses, J. "The computer in the home," in The Computer Age: A Twenty Year View, ed. M. L. Dertouzos and J. Moses, 3-20. Cambridge, Massachusetts: MIT Press, 1979.

73. Artandi, S. "Computers and the postindustrial society: Symbiosis or information tyranny?" Journal of the American Society for Information Science 33(5) 1982, 304.

74. Ibid., 305.

75. See, for example, Everto, A. "Legal issues faced by the European information industry," Electronic Publishing Review 1(2) 1981, 113-122; Butler, M. "Publishers, technological change, and copyright: Maintaining the balance," Drexel Library Quarterly 20(3) 1984, 28-41; Baumgarten, J. "Will copyright survive the new technologies? Should it?" ASIS Bulletin 9(6) 1983, 20-22; Melody, W. "The information society: Implications for economic institutions and market theory," Journal of Economic Issues 19(2) 1985, 523-539.

76. As noted by Ganley and Ganley, "Almost by definition, communications and information is not confined within national borders and almost by definition, the information society will be built by a series of events affecting many nations simultaneously." See Ganley and Ganley, To Inform or to Control, op. cit., 204.

77. For a discussion of the fair use doctrine arising out of the 1976 amendments, see Horowitz, I., and Curtis, M. "Fair use versus fair return: Copyright legislation and its consequences," Journal of the American Society for Information Science 35(2) 1984, 67-74; Stratford, J. "Library photocopying: A legislative history of Section 108 of the Copyright Law Revision of 1976," Government Publications Review 11(2) 1984, 91-100. See, also, ALA Commission, Report, op. cit., 83-86.

78. The responsibility of libraries to maintain confidentiality of patron files is an issue that has not yet received great attention. Study of this question is clearly warranted.

79. See, for example, Bortnick, J. "National and international information policy," Journal of the American Society for Information Science 36(3) 1985, 165-166; Consultative Committee on the Implications of Telecommunications for Canadian Sovereignty. Telecommunications and Canada. Ottawa: Supply and Services, 1979; Library of Congress, International Telecommunications, op. cit., 23; UNESCO, International Commission for the Study of Communication Problems. Many Voices, One World, Communications and Society Today and Tomorrow: Towards a New, More Just and More Efficient World Information and Communication Order. Paris: UNESCO, 1980; Shultz, G. "The shape, scope, and consequences of the age of information" (address before the Stanford University Alumni Association's First International Conference, Paris, March 21, 1986), Current Policy No. 811. Washington, D.C.: Bureau of Public Affairs, Department of State, 1986; Schiller, H. Communication and Cultural Domination. White Plains, New York: International Arts and Science Press, 1976.

80. Shultz, "Shape, scope and consequences," op. cit.

81. As noted by Ganley and Ganley: "United States technological and general economic superiority has been taken for granted since World War II. That superiority -- won partly by default -- was maintained for many years primarily because the United States had virtually no challengers. But it is impossible not to see the challengers now." Ganley and Ganley, To Inform or to Control, op. cit., 8.

82. Library of Congress, International Telecommunications, op. cit.

83. The inclusion of trade in services on the agenda of the Uruguay Round of GATT negotiations was a significant victory for the United States over strong opposition from several countries, including India and Brazil.

84. See, for example, Neavill, "Electronic publishing," op. cit.

85. Ibid.

86. Ibid., 77.

87. Books, of course, do go out of print. But the fact that a book is a physical object and that multiple copies will be produced in any print run means that there is a high probability of some copies surviving even without a conscious decision to preserve a copy as part of the cultural record.

88. The ability to modify a computer-based record while simultaneously erasing all previous versions of the record has major implications not only for the preservation of the cultural record but also for the existence of an audit trail within a great many spheres of activity. This may be of especially great importance in dealing with cases of the accountability of government and government officials.

89. This is, of course, not a new problem. Libraries regularly have to decide what to retain in their permanent collections as do most private and public sector institutions. The problem is, however, amplified in the case of computer-based information systems because of the increased transiency of information products and the need that such systems create for a more conscious or deliberate decision to preserve a particular file. The threat of censorship thus increases.

90. For a discussion of some aspects of the role of libraries in the new international economic environment, see Surprenant and Zande, "The developing crisis," op. cit.

Comments by Reviewers

The three reviewers who read this paper commented on the issues of information policy theory, as well as education and information policy. They also suggested additional areas of research.

Information Policy Theory

An issue that needs attention is the study of how information flows through our society. In addition to studying how the scholarly process for creation, production, distribution and consumption is changing, it would be well to call for more studies of information use by the "information poor" and marginal of our society as well as for the informed citizen. This is essential, not only from a societal perspective, but as a basis for a more research-based understanding of the user community, which is essential for the client orientation identified by Vagianos for the new information professional.

Is it possible that the chief threat to the library lies not in the new media or the new technology, but in the ominous erosion of the size of the reading public? The most relevant data are those measuring the increase of functional illiteracy in the United States in the past quarter century. Research is needed to identify what the principle causes are, and where the library can play a part to stop the problem.

Vagianos identifies policy areas where library research is needed and describes possible research projects. These research efforts must emphasize examination of social change, the requirements for society to adapt to the new information world, and the implications for a new social mission for the library.

Education and Information Policy

Vagianos recommends investigating retraining requirements for library and information professionals. Such studies should also include the investigation of alternative educational delivery mechanisms, techniques for assessing educational needs from a societal perspective, and identification of the barriers to retraining.

He also recommends investigating skills in training schools. Several new liberal-arts-oriented undergraduate programs in information studies have been initiated. An evaluation of the successes and failures of these programs might be important and suggestive for a broad-scale expansion of such programs.

Ph.D. programs should also be examined to determine whether we are preparing the right kind of people for professional adaptation and the development of new curricula. This is at least as important and probably more so than examining the Masters curriculum. Factors affecting recruitment of the new information professional must also be addressed.

Additional Areas of Research

- Vagianos discusses the emerging information networks: Studies are needed to look at the effect these will have on local organizations or communities. Will there be underinvestment in information production if it is left to the private markets? To what extent do private businesses profit from marketing government information? How is the role of depository libraries changing?

- Vagianos discusses cultural sovereignty: What about our cultural illiteracy, as documented by Hirsch, and the potential influence of information transfer through institutions like libraries in maintaining cultural sovereignty?

- The modern library in the United States is more than a century old. Through that period, alternative media have outdistanced it as sources of information -- the cheap, popular newspaper, the movies, radio, and television. However, none of these has detracted from the influence of the library, which serves a quite different function and may continue to do so in the future. The reason for this is certainly worth investigation, and would be an important piece of information to have at hand as we determine the library's future.

- Is the assumption that it is possible to develop an information policy reasonable? There is always an information policy; it just happens to be the sum of a lot of small things. Much effort can be diverted from short-range, directed, pragmatic efforts by waiting for the perfect tool. It clearly is necessary to define at least an "information vision," but is it practical to expect a comprehensive information policy to exist?

EDUCATION AND TRAINING OF LIBRARIANS

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Abstract

Strategic planning for library and information science education is critical for establishing university priorities and for making national policy. The transition of the United States and other countries from industrial to information societies has forced a broadening of the focus of librarianship to include a wide range of "information-oriented" curricula. Libraries use computers and communications as integral parts of both internal operations and services to their users, and they will continue to deal with new technological developments and new opportunities to expand the range of media and services they manage. Libraries will serve as the principal means for preserving these new technologies and assuring that they are readily available to meet future needs, just as they have for print media. Education for library and information science must prepare the information professional to handle these responsibilities with excellence, not mediocrity. The purpose of this report is to provide a frame of reference for a research agenda that will support public policy to meet these new requirements.

Introduction

Context

This report is in the context of a general review of priorities for research in librarianship and information science, with the objective of setting a research agenda for the coming decade. This kind of strategic planning is consistent both with national policymaking and with institutional objectives. It provides a context for innovation and for setting goals that reflect needs.

Historically, this kind of review has been undertaken previously. The seminal study certainly was that by C.C. Williamson.[1] In the late 1960s, an analysis similar to the current one was undertaken by the Office of Education as part of its planning for effective use of research funding.[2] In the 1970s, the Conant study of library education was undertaken;[3] though not focused on research needs, it did identify a number of research topics. Most recently, the Cuadra study of a research agenda[4] (which did not include education, but did cover all other aspects) and the King research study of library education[5] each provided specific research agendas. Most recently, the Department of Education sponsored a study, under the aegis of the American Library Association, for the purpose of identifying the means for involvement of other professional societies in the accreditation process;[6,7] while not a research project in itself, it did establish many of the agenda items for the current effort to establish a research agenda. Thus, these studies all provide a context for the current review.

Library education has undergone a dramatic change within the past few years. For the first time in its historical development, there was not a growth in the number of programs, but a dramatic reduction in them. From a high of 69 ALA accredited programs (including seven Canadian schools) in 1980, the number of programs has been reduced now to 60 (again, including the seven Canadian schools). That is a reduction of about 15% in less than a decade! In addition, the fundamental nature of many programs has also changed, with a shift from a focus on librarianship to the inclusion of a wide range of information-oriented curricula. The change is far greater than simply a cosmetic change in name, and the stated intent has been to meet the needs of a far wider range of employers and operational contexts.

This, therefore, is an especially critical time for a review of library education to determine both where we are and where we should be going. The purpose of this report is to take that evaluative look and, by so doing, provide a frame of reference for a research agenda that will support public policy to meet future needs. The means to accomplish this end have included a series of planning panels at which library educators, practitioners, and representatives of professional societies and of national interests have convened to identify objectives, needs, and priorities. Based on those discussions, a set of position papers was then commissioned, this one among them.

Fundamental Position

In developing this paper, I have tried to represent the views expressed by the several participants in the planning panels, but in doing so I obviously bring my own biases and perspectives. It is therefore crucial to be specific in identifying my own views, since they provide the fundamental basis for the positions presented. My view is that libraries are important institutions in society and that they will continue to be important in the decades to come. A corollary view is that librarianship as a profession is important, even noble, and that library education should therefore have the goal of preparing persons for the highest level of professional aspiration.

These views reflect a philosophical position and some facts, assumptions, and conjectures:

- It is my philosophical position that the open, ready availability of information is essential to our society and culture, to our political process, to our economic well-being, to our scientific development, and to the welfare of individuals.

- It is a fact that the library is an institution of continuing stability, with established roles and relationships to the constituencies it serves and with clear commitments to that philosophical view.

- I assume that the library will continue to maintain that stability in the future and will continue to relate well to the constituencies served in assuring ready, open availability of information.

- It is a fact that books, journals, manuscripts, and other printed media continue today to be vital records of the past. It is also a fact that the library has served as the principal means for preserving those printed records and organizing them for ready availability to meet today's needs.

- I conjecture that printed media will continue to be economical and effective means of information distribution even as newer media continue to develop and complement the printed forms, and that the library will continue to fill an essential responsibility in preserving them and providing access to them.

- It is a fact that libraries have accepted responsibility for new media and new services, integrating them into library operations and services with a high level of effectiveness and economy of operation. In particular, they have adopted the use of computers and telecommunications as integral parts of both internal operations and services to their users.

- I conjecture that libraries will continue to deal with new technological developments and new opportunities to expand the range of media and services they manage in the future. Perhaps even more important, though, I conjecture that libraries will serve as the principal means for preserving these newer technologies and assuring that they are readily available to meet future needs, just as they have for print media.

- It is a fact that the library community has created professional staff highly committed to the view that information is important and with the professional qualifications to provide effective information services.

- I assume that the commitment and high level of qualification of library professionals will continue in the future. A major purpose of this report is to contribute to the fulfillment of that assumption.

These perceptions and beliefs all need to be identified clearly so that they are recognized as the basis for this report. Substantially different views may be held by others. Indeed, some have argued that libraries are not significant to society and that other information agencies are more dynamic and aggressive, more in the mainstream of current and future developments, and more important to the economy. They have claimed that librarians are too passive, outmoded in their methods, and wedded to "the book." Among the research questions that should be considered is the evaluation of which view of libraries and librarians best represents their importance. Given the principles presented above, however, this report is aimed at the objective of excellence in education for librarianship and information work. All of the questions presented as the basis for a research agenda are aimed at maintaining and increasing the personal commitment and intellectual qualification of librarians as centrally important information professionals in our society.

Means for Assessment

Ah, but what is "excellence" in education for library and information science? How do we assess it? How do we measure it? How important is it to the information professional?

There are several means that can be applied to assessments of library education. First, there are formal assessments, represented by the reports cited above[1-5] and by the papers in this book. They have the value of concentrating attention on the broad range of issues, and they help in setting national agendas.

A second, quite different kind of assessment is provided by manpower studies, which can identify gaps in skills in the national pool of professional manpower and information service agencies. They can identify critical factors in meeting the manpower needs -- salary levels, status and image, responsibilities and positions. To an extent, manpower studies supplement formalized assessments by establishing some quantitative goals. They provide estimates of magnitudes and specific areas of needs.

The third kind of assessment is essentially programmatic. It includes accreditation by the ALA Committee on Accreditation as the body formally charged with this responsibility. It also includes a variety of state credentialling (especially in the school library field) and certification by professional societies (best represented by that of the Medical Library Association). These processes provide a continuing assessment of the quality of both formal educational programs and professional practitioners.

A quite separate kind of assessment is provided by educational institutions themselves, in periodic academic review of their programs and in continuing review of faculty in decisions for appointment, promotion, and tenure. From an operational standpoint, these are surely the most critical in determining the nature and quality of degree programs.

Important in those internal evaluations, but also providing independently useful means for assessing quality, are the results of national competitions, awards of grants and contracts, and recognition given to the contributions of individual faculty and students. The internship programs of the Library of Congress and the National Library of Medicine and the residency programs being established at several major research libraries all provide means for evaluating the quality of graduates from degree programs. The peer review processes used by the National Science Foundation and the National Library of Medicine are highly effective means of assessing the quality of faculty research proposals. Awards by professional societies and affiliated industrial organizations recognize the quality of contributions by individuals.

Finally, there are periodic attempts to assess the relative ranking of schools. Most of these have been qualitative, even subjective, reflecting the individual assessments of deans, faculties, and professionals. A few have been quantitative, based on published statistics about the sizes of schools or data about citations to research in the field.

Of all of these means for assessment, the most uniformly applied and most generally accepted surely is the accreditation process of the American Library Association. It has been formalized in the 1972 Standards for Accreditation;[6] it is continuously applied and to every program wishing to be so evaluated; and it is recognized as valid by both employers and government agencies. While the criteria are used primarily for evaluation of formal "first professional degree" programs, they serve well in identifying the crucial issues for every kind of educational experience. Further, the formal degree programs today are still the primary means used for professional education, and most of the attention of this paper will be focused on them. It is therefore appropriate that it be organized around the structure of the 1972 Standards for Accreditation. In the Standards, the criteria for judging programs are grouped into six major categories: goals and objectives, curricula, faculty, students, governance, and resources. However, in addition to that basic structure, in the discussion of issues and questions that lead to a research agenda with the objective of furthering excellence in education for library and information science, most of the other means for assessment of quality will be referred to explicitly.

The Larger Context of Information Science Education

In adopting this structure for presentation, I am focusing on the library, with information science viewed in its relationship to that focus. The focus and resulting narrow application of information science are consistent with the topic that was identified for the paper -- education of librarians -- and with the fundamental position of the paper, as identified above.

It is important to recognize, however, that information science is a very broad field of study. Because it encompasses theoretical studies of information organization and retrieval, it is significant to librarianship. The closely related fields of indexing and abstracting, of online information retrieval, and of computer-based publication share many of the same methodologies and theoretical concerns; the history of developments in information science applications in those fields have been intertwined with those in librarianship. As a result, schools of library and information science are the natural academic units to be responsible for education and research in those areas.

As we move from these foci, the degree to which information science is important to fields beyond the profession of librarianship increases. Information system design, artificial intelligence and expert systems, the wide range of topics now being called "cognitive sciences" (including, for example, psychology and linguistics), computer hardware and software, communications as both an engineering discipline and a social science, management information systems in business and government, information policy -- these concerns, for both research and education, become at the least areas of overlapping interest. In many cases, indeed, the interests of library schools, while very real and significant to them, will be dominated by those of other academic departments.

In particular, schools of engineering have established departments of "information science" as well as of "computer and information science." Schools of business or management almost uniformly have information systems departments. Schools of medicine have programs in "medical informatics." Many universities are creating academic units encompassing the cognitive sciences. Law schools have a legitimate claim on copyright, and economics departments on the economics of information. In other words, schools of library and information science are not alone in establishing a role in the "information society," nor are they the only academic programs providing education for information professionals.

All this, of course, raises many questions requiring research if national and institutional planning for education in library and information science is to be solidly based. How should these diverse programs be assessed? What differences in goals and objectives characterize the various programs? What constituencies does each serve? What differences are there in curricula? To what extent does each depend upon, cooperate with, duplicate, or compete with the others? How do the qualifications, interests, and research foci of faculty compare among the various information programs? On what basis do students choose among the various types of programs? What are the expectations of students in each of them? What differences are there in requirements for students -- for admission and for graduation? What are the differences in resources required for different kinds of programs? What reconfigurations of academic structure may be needed to rationalize the full range of information-related programs?

With respect to that last question, in particular, there have been a few examples already of library schools merging with other academic departments. Several library schools have added new departments of information science or of communications. In virtually every library school new constituencies are being identified, beyond the historical focus on libraries. But, at the same time, many universities have considered closing their library schools and some have done so. The result is a question of direct significance to planning for education of professional librarians: With these academic changes, what is happening to the commitment to library education? How will that commitment best be met, especially if the objective is excellence?

Goals and Objectives

As indicated above, there have been some dramatic changes in the goals and objectives of formal degree programs, especially during the past decade. However, the facts are that the primary constituency served by formal degree programs in library and information science continues to be the library. Of course, that term encompasses a broad range of types of libraries -- from school and public to academic and special -- and it must be recognized that the term "library" itself has become very broad conceptually, encompassing an even broader range of activities and responsibilities. Therefore, it is natural that the goals and objectives of degree programs continue to be determined primarily by the needs of the primary constituency, the library.

Societal Changes

Perhaps the most dramatic issues arise with respect to the effects of societal changes. The transition of the United States from an economy based primarily on manufacturing to one that is now predominantly based on information has been clearly identified. It places library and information science at the center of responsibility. To what extent therefore should the goals of formal degree programs be modified to recognize the increasing importance of information in society?

Should students be prepared to deal with the complex issues of information policy? Of societal and institutional decisionmaking concerning allocation of resources to information processes? Of the interaction between the public and private sectors? Of intellectual property rights?

Such responsibilities would appear to be essential to a high level of professional work, but to add these responsibilities would substantially increase the demands on the curricula: it would require additional background in political and economic theory, and it would require new kinds of faculty expertise.

The effects of information technology appear already to have been well absorbed into the goals and objectives of formal degree programs in library and information science. Today, there surely is no program that does not include within its goals and objectives automated cataloging, online reference retrieval, and experience with the use of microcomputers. However, technological trends are continuing to expand the scope of media and forms of information. To the now standard reference textual databases, the library and information center must add coursework dealing with numerical databases and graphical and digitized image databases; it must deal with an increasing variety of optical storage media; and it must be able to work with telecommunications networks. To what extent should the goals and objectives of the formal degree programs be expanded to accommodate these outgrowths of automation? On the surface, this accommodation would appear easy, given the success in dealing with automation to date. However, such expansion implies the need for increased equipment resources and greater commitment of time in the curriculum to automation.

A totally different, but equally dramatic, phenomenon in the nation's society is the rate of demographic and cultural change. The number and range of ethnic groups, the increasing percentage of elderly in the population, and the geographic shifts of population all lead to corresponding changes in the needs for library services and in the kinds of services that are appropriate. To what extent should formal degree programs include goals and objectives related to these societal changes? Incorporating them would almost certainly require changes in the ethnic and cultural composition of faculty and students. It could require new kinds of curricula and new relationships with other academic programs, such as ethnic studies and area studies.

Constituencies Served

In a sense, the primary constituency served by any education program is the student. I have already alluded to the demographic and cultural changes that are occurring in the society at large. Surely these will be reflected in students and in their expectations of academic programs. To what extent should goals and objectives be restructured to accommodate those expectations?

Usually, the term "constituency" is taken as referring to the kind of employment markets that a program aims to satisfy -- typically expressed in terms of a "type of library." To what extent should goals and objectives reflect the needs of those constituencies? How broadly should a given program identify the constituencies it serves? To what extent is the constituency tied to particular geographic areas? Are there programs that should aim for a national constituency?

Constituencies other than the library have become increasingly important. Indeed, for some schools, a majority of graduates are finding employment in situations other than libraries, assuming responsibilities in database services, as entrepreneurs and in small information enterprises, in publishing and the book trade, and perhaps most dramatically, in information resources management in government and industry. These "new constituencies" have become increasingly important as employers of graduates of library schools. To what extent should and do they place different demands on the goals and objectives of degree programs in library and information science?

The relationships with the profession are critical to formal degree programs, and the goals and objectives frequently are designed to satisfy the expectations of the profession. Indeed, the accreditation process of the American Library Association requires that schools provide formal statements about their goals and objectives that respond to the views of the professional societies. But what are those views? How are they changing? To what extent should the specialized interests of different professional groups be recognized in goals and objectives? Are there new professional groups whose needs must be included?

Educational goals and objectives may be considered at several program levels -- from the undergraduate to the first professional degree, to the various means of specialization, to the "second Masters," to the doctorate, and to continuing education. What are the needs for each of them? How do their respective goals interrelate and either support or interfere with each other? How are the goals for each to be determined?

Finally, there are various contexts within which educational programs can be considered. The emphasis in this paper, to this point, has been on formal degree programs, and that may be an appropriate focus for policy consideration. However, there are other contexts that, at the least, must interact with the formal degree programs and to some extent may replace them. In particular, there are means for on-the-job staff development; there are commercial training programs (such as those provided by the vendors of online data services, but with the potential for a far wider range); and there are various forms of continuing education, both profession-directed and individual-directed. How should goals and objectives be established for these educational experiences? How should they be evaluated and validated?

Curriculum

The curriculum of an educational program is the formal means by which its goals and objectives are met. It serves as the objective statement of results to be expected and, in a real sense, serves as the "contract" between the student and the program, between the professional and the school. What should curricula provide in the way of preparation?

Skills, Attitudes, and Knowledge

The King study[5] clearly identified the range of skills, attitudes, and knowledge needed for professional information work, considering the wide range of employment contexts. It hardly seems necessary to replicate such a wide-ranging study for some time to come. However, there are implications of that study that do need to be explored. In particular, and most important, how should they be reflected in formal curricula? At what level of competence should the curricula aim? Entry-level? Professional level? Managerial level? Research level? Each would place dramatically different requirements on faculty, students, and resources. To what extent should personal attitudes be the responsibility of the individual? Of the educational program? Of the employers?

Core Content

The "core" of curricula for library and information science has been well identified and appears to be universal across all kinds of information work. Whatever the titles of courses may be, that accepted core appears to include cataloging (or "organization of information"), reference (or "information retrieval"), selection, management, and orientation to the profession. It may include the development of skills in research and interpersonal relations. Do these, even though generally recognized as such, indeed represent the core requirements for professional information work? Are some of them now no longer needed? Should others be added? These are not trivial questions and are not lightly asked; they have been the subject of debate within both the profession and the faculties of every school.

Some rather more specific questions relate to the effects of changing technologies on the need for and nature of core professional knowledge. Has automation eliminated the need for "cataloging," for example? Or has it so changed the nature of cataloging that it must be treated as something else? Has it so changed the nature of reference work that it too needs to be treated as something other than the traditional emphasis on sources?

Beyond the question of what constitutes the core is that of how it should be organized and what priority should be given to each component. Related and usually representing the context for debate is how much time in a curriculum should be devoted to core courses and whether they should be required of every student. Again, these are not trivial questions. The debate usually represents dramatic differences in views of the very process of education, of the needs for professional work, and of the role of the formal degree in meeting professional requirements.

Fieldwork, Internship, Residency, and Experience

The value of practical on-the-job experience is well recognized and, to one extent or another, in one form or another, it is included in most formal degree programs. Indeed, one form of experience -- that of "academic apprenticeship" as a teaching assistant or research assistant -- is a normal part of academic life. Another form of experience -- participation in governance of a school -- frequently is a natural component of student life. Each of these provides invaluable experience in the most critical aspects of professional information work: teaching, research, evaluation, and participatory management. To what extent are these recognized, and how effective are they in providing experience of value for future professional work?

The more formally identified contexts for experience, though, are usually the interpretation of interest. To what extent should degree programs include "practica" and formal internship? What are the working relationships between the school and the sites? What fills the needs for schools in isolated areas, remote from major collections or libraries?

Most recently, the concept of "residencies" -- postgraduate internships -- has added a new dimension to experience as part of education. How should these programs relate to formal degree programs? How are they to be assessed? What are the most appropriate kinds of experiences within them? Are they concentrated on single areas, or do they cover the full range of professional work?

Specialization

A fact that has complicated the design of curricula of schools of library and information science is the limited time frame (typically, one year) for accommodating both core courses and specializations. The task is further complicated by another fact: each library school has claimed to cover virtually every specialization, whether by type of library, type of function, type of medium, or type of subject area. It is difficult to assure that the faculty expertise and other resources needed for those specialties will be available.

The result is a wide range of critical research issues related to specialization. What are the potential levels of skills that a school can provide? Is there a possibility of differentiation among schools with respect to specific specialties, at least at the more demanding levels of qualification? What relationship do specific specialties have to the related professional societies, and how should their views be considered in the process of curriculum development? What are the specific specializations that need to be considered in curriculum planning?

Theory and Practice

Most discussions of curricula for library and information science draw a distinction between "theory" and "practice," usually with a pejorative attitude that there is too much theory, too little practice. Indeed, the view of practicing professionals frequently is that library education does not prepare graduates for the "real world" of practice.

The view of educators, at least of those who seriously consider the question, is that theory and practice must go together in library education. Theory is necessary to provide the student with a broad perspective, a structure on which to base responses to specific practical situations. Within such a theoretical approach, instruction in practice becomes a means for teaching theory and a result of the educational process, though perhaps not its intent.

What, then, is the relationship between theory and practice as courses actually are taught and as they should be taught? How does one measure the degree to which either theory or practice is being taught? What levels of theory and practice should be provided in library education?

Acculturation

Much of library education is designed to acculturate the student to the profession. The fact is that most students come to librarianship with little knowledge of the nature of the field. They are drawn to it for a variety of reasons, most having nothing to do with the nature of the profession. The student needs to be provided a professional philosophy, and to develop a commitment to that philosophy and an awareness of the traditions and history that created it. Most curricula provide such orientation through introductory courses (which universally appear to be detested by the students, but on the other hand are regarded by the faculty as essential).

What is the role of acculturation as part of education for library and information science? How is that role currently fulfilled in library education? What alternatives should be considered?

Interdisciplinary Coursework

The Standards for Accreditation of the ALA-COA[6] call for recognition in library programs of the need for interdisciplinary knowledge. But most curricula provide minimal opportunity for coursework outside the professional courses of the school. On the other hand, many specialties ought to involve substantial coursework, either taken as part of the library school program or before or after it. A complicating factor for most interdisciplinary coursework is that there are likely to be prerequisites for advanced courses in other departments.

What should be the role of interdisciplinary course work in the library school curriculum? What level of interdisciplinary course work is necessary for specific specialties? How can these needs be accommodated in the curriculum? How can students gain the prerequisites for admission to desired courses? What is the role, both currently and potentially, of coordinated degree programs that provide education both for the profession and in a substantive discipline? To what extent are "double Masters," gained either through such coordinated degree programs or separately, necessary for excellence in professional practice or at least desirable?

A complicating issue is the extent to which the traditional academic departments -- the ones that typically are in the colleges of letters, sciences, and arts -- focus their attention, in graduate work, on the doctoral degree. For them, in sharp contrast to the professional schools, the Masters degree is merely a consolation prize or, at best, a way-station on the road to the real goal, the Ph.D. They regard students aiming for a "terminal Masters," either in their own field or in a professional one, with some disdain, and frequently discourage students who hope to gain interdisciplinary knowledge or who have the objective of a double Masters. How can the goals of a professional program be reconciled with those of traditional academic departments?

Research Knowledge

The role of research competence in education for library and information science is not clear. Many would argue that the information professional must have research competence, and for a variety of reasons. Others may argue that it is not necessary for professional practice and in fact would further complicate the problems of curricula that are already too theoretical.

What is the role of research competence in professional practice? To what extent should coursework in library and information science provide research competence? How should it be developed -- through coursework in research methodology, through research seminars, through individual research projects? To what extent, and how, are curricula currently providing research competence to students?

Length of Program

Underlying many of the questions relating to curriculum is the debate over the length of the degree program. Today, all but a few of the accredited programs are one calendar year long, providing about 500 hours of class contact between students and teachers. The few that depart from this pattern are from five to six quarters long -- more or less two academic years -- for a total of nearly 750 hours of class contact or the equivalent. Many schools, however, have followed an intermediate path, awarding the professional degree after one academic year but urging students to continue, with a sixth-year specialization certificate awarded.

What are the relative costs and advantages of programs of different lengths? How, and how well, are the ranges of curricular objectives met in programs of various lengths? What length of program would best meet the goal of excellence in education of the information professional?

Faculty

The third major critical element -- perhaps the most critical of all -- is the faculty. It is they who will create the curriculum and teach it. It is they who will provide role models for the students and serve as the means for their acculturation. Thus, the quality of formal degree programs is almost totally determined by the quality of the responsible faculty. What can be done to increase that quality? What is the current quality of faculty? What are the criteria for measuring that quality?

Assessment of Quality of Faculty

Schools of library and information science, along with most other professional schools, face a serious dilemma in reconciling the demands of academic advancement with the responsibilities to the profession. Today, most universities apply criteria in appointment, promotion, and tenure decisions that emphasize "research productivity" -- measured by the number and quality of publications in refereed journals. They look to the numbers of grants and contracts awarded for research. They look to the awards from organizations like the National Academies of Science and Engineering, which recognize research achievements. In contrast, contribution to the profession is rarely given significant weight, if it is considered at all. The relationship to the profession is deemed important only within the school itself.

There is thus a fundamental tension between the imperatives of academic advancement and the requirements of a professional degree program. The first places primary emphasis on research productivity; the latter requires a high level of professional qualification and, perhaps, experience. While the two need not be in conflict, they do in fact require quite different commitments. Can they be reconciled? What is the relative importance of each?

Critical Mass

Library schools are among the smallest of schools in almost any university. Indeed, the average number of faculty among library schools today is fewer than ten; the median number is eight; and some schools have been accredited with fewer than five faculty! There have been criticisms of schools for operating at such a low level of staff and of the ALA-COA for accrediting schools without a large enough instructional staff. Is there a "critical mass" for size of faculty? Should there be enough permanent faculty to assure that they can cover the core courses and do so with depth? What is the number of faculty needed to cover a claimed range of specialties?

Range of Expertise

A clearly related question is the range of expertise represented on the faculty, especially in relationship to program objectives. What are the levels of expertise and the numbers required to meet the various levels of specialization? What are the levels and number required to assure coverage of core professional skills?

Students

Ultimately, the quality of formal educational programs is determined by the quality of the students themselves. What can be done to maintain and improve that quality?

Recruitment

Obviously, one answer is to improve the means of recruitment, with the objective, as usually stated, of "getting the best and brightest." Who attends schools of library and information science? What is their academic preparation? Their gender? Their ethnicity? Their geographical focus? What is their motivation for attending? What are their expectations? What is the effect of affirmative action? Of foreign students?

One possible problem is the fact that most library schools draw their students from rather narrow geographic areas. This forces them to meet the needs of their particular geographic constituencies and to depend upon the quality of the students available to them. Recruitment is therefore limited in scope and in effectiveness. Would it be desirable to create a national pool? And if so, how?

There are well-established means for recruitment: library managers who may identify potential students from their institutions, their staffs, or their clienteles; graduates of programs; and national publicity. How effective are they, both in attracting students and in improving their quality?

Increased Requirements for Admission

Currently, most programs specify requirements as simply "undergraduate preparation with a good liberal arts background." There may be some additional requirements, such as GPA and GRE scores, though frequently those are honored more in the breach than in the imposition. What are the necessary and appropriate requirements for admission to a Masters degree program in library and information science? What would be the effect of increasing those requirements? What is the experience of schools in establishing increased requirements? What is the current range of requirements? What is the relationship between admission requirements and the content of curricula?

Are any of the following appropriate prerequisites either for admission or for specific coursework in the curriculum: (a) Foreign language? (b) Statistics? (c) Computer programming? (d) Accounting? (e) Communication skills? (f) Writing skills? (g) Literacy? (h) Others? How should these prerequisites be satisfied? Through coursework in the school? Courses in other schools or institutions? Undergraduate preparation?

Undergraduate Preparation

A somewhat less stringent approach is to establish recommendations for undergraduate preparation. Currently, most schools require simply a liberal arts undergraduate degree, without further specification of course work that might be desirable or expected. In contrast, law and medicine have established "pre-law" and "pre-medicine" curricula as desired, expected, or required preparation. What would be the effects of establishing a "pre-library and information science" curriculum? What might be the content and structure of such a curriculum? How would such a recommended undergraduate preparation be implemented?

Resources

The resources required for support of educational programs have become increasingly diverse and more costly. Whereas, at one time, it was sufficient to have a good, though perhaps small, reference collection and suitable copies of standard tools for cataloging instruction, schools now must have media collections, computers and equipment for online access, telecommunication equipment, CD-ROM disks, and readers. What are the resource requirements for excellence in education for library and information science? What are the minimal needs? Where can they best be provided? In the school? In the institution? In the community? At national centers? Through industrial participation?

Governance

The final category of criteria included within the 1972 Standards for Accreditation[6] relates to governance of the school or program. On the surface, this appears to be essentially an institutional responsibility. Indeed, it may well be that the primary focal point for determination of quality and enforcement of appropriate standards of excellence must be the institution, and that must include responsibility for governance.

The concern of the Committee on Accreditation, of course, is to ensure that there is an appropriate degree of independence in determining the content of the program, without undue restrictions imposed by the institution. Faculty responsibilities, the authority of the program's executive officer, and the ability to determine goals, objectives, curricula, and faculty appointment decisions are the issues considered.

What are the differences among programs in academic independence? What is their effect on the quality of programs? What can be done with respect to governance that will increase the quality of programs?

One aspect of governance little treated in the literature -- and yet, from the evidence of the past few years, one of exceptional importance in the continued viability of programs -- is that of isolation. To what extent is a program of education for library and information science regarded as central to the mission of the institution? To what extent does the program have ties, academic and personal, with other academic programs? To what extent does it participate in the governance of the institution as a whole?

Other Contexts for Education

The discussion to this point has focused on formal programs of education leading to the "first professional degree." Such a focus is natural, since these are the programs that have been the traditional basis for professional practice at least since the time of the Williamson report.[1] Clearly, though, they are not the only means of serving an objective of excellence in the preparation of professionals. Indeed, it is generally recognized that the degree represents merely the starting point, and that continuing education is the true sign of the professional.

At the other end of the process is the belief, held by some, that the need is not so much for education at the advanced, graduate and professional level, but rather at the undergraduate, technician level. Much of the work in libraries, it is claimed, can be done better and less expensively by well trained technicians.

Doctoral Programs

Two kinds of doctoral-level programs are offered in library schools today -- research doctorates and professional doctorates. The former usually are entitled "Doctor of Philosophy" (though there are many departures from that terminology); the latter, "Doctor of Library Science." Today, in large part, the faculties of library schools consist of holders of one of these doctoral degrees, although a substantial minority hold doctorates from other academic disciplines. All types of doctoral degrees -- both those from library schools and those from academic disciplines -- are also held by some practicing professionals. Thus, the doctorate is an important component of education in and for the profession, from whatever source it may come.

Traditionally, evaluation of the doctorate is considered the prerogative and responsibility of the granting institution. It is not evaluated in the accreditation process of the American Library Association (except for the peripheral effect it may have on the first professional degree program). Yet evidence has been presented in the literature suggesting that a doctoral program is associated with overall quality in the school.

62

What is the role of the doctorate in professional practice and education? How should the effectiveness of the doctorate, as it relates to the profession (rather than to the academic enterprise), be evaluated?

Executive Programs

Given the view that libraries are important institutions, it is vital that there be executive leadership that can deal with the long-range policy issues faced by libraries. Clearly, such leadership derives not from the formal degree programs that lead to the first professional degree, though it may be aided by doctoral-level work. It in fact derives from the quality of performance throughout a career, from the willingness and ability to assume responsibility, and from the record of achievement.

It is precisely this kind of context that makes "executive programs" in industrial management and other professional contexts so important, and they should be equally valuable to top executives with information responsibilities. There are already several examples of such executive-level programs for librarians, one being the Senior Fellows' program sponsored by the Council on Library Resources at UCLA. As a result, there is experience on which to base an assessment of the value of such programs to the advancement of excellence in the profession.

What has been the experience of participants in such programs? What have been their subsequent performance and advancement? What are the appropriate content and organization for executive programs in this field? Who should conduct them and under what aegis -- academic, professional society, consortia of libraries? What are appropriate costs and how should they be funded? What kinds of instruction are most effective -- formal courses, seminars, experience in group dynamics? What length and format are most effective? What are the best means for evaluation?

Management Training

Of much the same intent, but used at a somewhat earlier stage in career development, are the several forms of management training. The Council on Library Resources again provides a specific example in its "management internship program." Other such programs have been provided by professional societies and academic institutions. The questions for research investigation in this context are the same as those for executive programs.

Sixth-Year Specialization

The most formalized programs for continuing education are the sixth-year specializations offered by most schools of library and information science. They have not been notably successful, with relatively limited enrollments, limited scope of specialization, and marginal success in the results. The reasons appear to be the cost in commitment of time -- usually an academic year if taken full-time.

What is the effectiveness of sixth-year specializations, especially if undertaken some years after completion of the first professional degree? What has been the experience of graduates of such programs, especially in comparison with persons getting a second, subject Masters? How can the quality of such programs be evaluated, given that they are not subject to review in accreditation or any other formal process? What specialties have been most essential in meeting the needs of the profession?

In-House Training

Currently, in-house training for information professionals or for any other staff of libraries appears to be very informal. There is little evidence in the literature of the existence of formal programs for making staff aware of the specifics of a particular library's operations, clientele, services, policies, procedures. There is even less in the way of criteria or means for evaluation of such programs.

One can visualize formal programs that would encompass the full range of in-house training. They could provide the new employee with orientation; they could make the new professional aware of the specific technical decisions represented in the library's policies; and, at a later stage, they could provide the person about to move into management responsibilities with a review of the policies and procedures to be followed. At a still later stage, they could provide the manager and executive with the institutional background needed to participate at the policy levels of the library and the constituency it serves.

What has been the experience with this kind of in-house training? How have the programs been implemented? What do they cost, in direct expenses and in staff time? How do they relate to professional associations and unions?

Undergraduate Training

As mentioned earlier, some have viewed undergraduate training as the priority approach to providing adequate staff for libraries, usually for economic reasons. That is, why pay the costs involved in a lengthy graduate education if the work can be done well enough by persons prepared at the undergraduate level? Indeed, several undergraduate programs for training library technicians have long existed, and within the past decade a number of undergraduate programs have been established to prepare "information resource managers" for industry. Clearly, these programs fill real needs and, in general, enroll greater numbers of students than do professional degree programs.

What is the appropriate role of undergraduate training in library and information work? What is the working effectiveness of staff prepared at the paraprofessional level? What is their path for subsequent career advancement? What should be the content and organization of undergraduate programs if they are to support a goal of excellence in information work?

Conclusion: The Research Agenda

The issues requiring research with respect to library education have been presented here in the form of sets of questions, each set in the context of a particular aspect of library education. Most of these aspects have been grouped into the structure presented in the 1972 Standards for Accreditation of the American Library Association, but the discussion of information science in the more general sense, and the concluding examples of other means for library education, represent programs that are not encompassed by the accreditation of library programs.

Each set of questions is intended to identify data needed for policymaking at both a national and institutional level. Each of them is answerable by derivation of appropriate data and by suitable analysis of those data; they are thus suitable subjects for research and together provide a research agenda for library education. While the stated orientation of this paper is toward excellence, the questions and related research will be needed, whatever the policymaking objective may be.

Among these research questions, some appear to be especially critical; others clearly are far less important for decisionmaking. The following list is presented in the order of priorities that represent my own assessment of the degree to which each question is indeed critical:

1. How important is the professional librarian to society, and what is the evidence of that importance?

2. What are the proper roles and responsibilities of various academic programs in meeting the needs for professional librarians?

3. What are the appropriate means for measuring the quality of library educational programs?

4. What is and, with the objective of excellence in library education, what should be the effect of societal changes on programmatic goals and objectives?

5. How should specialization be dealt with in first professional degree programs?

6. What is the essential minimum of faculty for first professional degree programs, considering both numbers and qualifications, in the context of excellence in professional preparation?

7. How can the quality of students best be advanced, considering recruitment, admission requirements, and recommended undergraduate preparation?

8. Of the various alternatives for continuing education for the profession, which are the most effective in terms of advancing excellence in the information profession?

Bibliography

1. Williamson, C. C. The Williamson Reports of 1921 and 1923 (including Training for Library Work, 1921, and Training for Library Service, 1923). Metuchen, New Jersey: Scarecrow Press, 1971.

2. Borko, H. Targets for Research in Library Education. Chicago: American Library Association, 1973.

3. Conant, R. W. The Conant Report: A Study of the Education of Librarians. Cambridge: MIT Press, 1980.

4. Cuadra, C. A Library and Information Science Research Agenda for the 1980s. Final Report. Santa Monica: Cuadra Associates, 1982.

5. Griffiths, J. M., and King, D. New Directions in Library and Information Science Education. Final Report. Rockville, Maryland: King Research, Inc., 1986.

6. American Library Association, Committee on Accreditation. Standards for Accreditation, 1972. Chicago: American Library Association, 1972.

7. American Library Association, Committee on Accreditation. Accreditation: A Way Ahead. Chicago: American Library Association, April 1986.

Relevant Literature

In preparing this paper, the published literature was considered, but it was not a substantial determinant of the positions presented, the questions raised, the research agenda identified, or the priorities suggested. However, there is some value in relating the most recent publications -- say of the past five years or so -- to the views presented. The following discussion of references is therefore grouped into four categories, representing the primary areas of attention in this paper:

- Overviews of history, of the effect of information science, of recent and current societal changes, and of international issues.
- Assessments of requirements, of markets, of competencies, and of the MLS as the basis for professional librarianship.
- Commentaries on particular constituencies, such as academic, special, public and school libraries, records managers and archivists, and information service organizations.
- Descriptions of issues in the educational process itself (faculty, curriculum, subject coverage, research) and of the alternative means for providing it (the MLS program, internship, continuing education, undergraduate).

The references presented here were, with a few classical exceptions, published within the past five years (1982-1986).

Overview

Among the most valuable references is one of historical significance:

Shera, J. H. *The Foundations of Education for Librarianship*. New York: John Wiley & Sons, 1972.

Supplementing this have been recent studies of historical developments in education for library and information science, including the following:

Davis, D. G., and Dain, P. "History of library and information science education" (papers issued in advance of the Library Education Centennial Symposium special issue), *Library Trends* 34(Winter) 1986, 357-531.

Rayward, W. B. "Research and education for library and information science: Waples," *Library Quarterly* 56(4) 1986, 348-359.

Richardson, J. "Theory into practice: W. W. Charters and the development of American library education," in *Reference Services and Library Education: Essays in Honor of Frances Neel Cheney*, 209-223. Lexington, Massachusetts: Lexington Books, 1983.

Robinson, W. C. "Time present and time past (issues in education for librarianship)," *Journal of Education for Library and Information Science* 26(Fall) 1985, 79-95.

Sullivan, P. "ALA and library education: A century of changing roles and actors, shifting scenes and plots," *Journal of Education for Library and Information Science* 26(Winter) 1986, 143-153.

A third set of valuable references relates not to education for library and information science, as such, but instead to the societal context to which it must respond:

Bell, D. *The Coming of Post Industrial Society*. New York: Basic Books, 1973.

Feigenbaum, E., and McCordick, P. *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World*. Reading, Massachusetts: Addison Wesley Publishing Company, 1983.

Hayes, R. M. "Strategic planning for information resources in the research university," *RQ* 25(4) 1986, 427-431.

Holden, C. "Simon and Kahn versus Global 2000," *Science* 221(460S) 1983, 341-343.

Horton, F. W. "Redefining productivity for the information age," *Information Management* January 1983, 26-27.

King, D. W., *et al*. *A Study of the Value of Information and the Effect on Value of Intermediary Organizations, Timeliness of Services and Products,*

and Comprehensiveness of the EDB. Submitted to the Office of Scientific and Technical Information, U.S. Department of Energy. Rockville, Maryland: King Research, Inc., 1984.

Machlup, F. Knowledge: Its Creation, Distribution, and Economic Significance. Volume I. Knowledge and Knowledge Production. Princeton, New Jersey: Princeton University Press, 1980.

Machlup, F. Knowledge: Its Creation, Distribution, and Economic Significance. Volume II. The Branches of Learning. Princeton, New Jersey: Princeton University Press, 1982.

Machlup, F. The Production and Distribution of Knowledge in the United States. Princeton, New Jersey: Princeton University Press, 1962.

Machlup, F., and Mansfield, U. The Disciplines That Study Information and Are Ordinarily Taught in Programs of Information Science. Consultant's report for "New Directions in Library and Information Science Education," submitted to King Research, January 1983.

Machlup, F., and Mansfield, U., eds. The Study of Information: Interdisciplinary Messages. New York: John Wiley & Sons, 1983.

Naisbitt, J. Megatrends: Ten New Directions Transforming Our Lives. New York: Warner Books, 1982.

National Commission on Excellence in Education. A Nation at Risk: The Imperative for Education Reform. Report to the Nation and the Secretary of Education. Washington, D.C.: U.S. Department of Education, 1983.

Porat, M. U. The Information Economy. Office of Telecommunications Special Publication (77-12-1 to 9). Washington, D.C.: U.S. Department of Commerce, 1977.

U.S. Congress, Office of Technology Assessment. Global Models, World Futures and Public Policy: A Critique. Washington, D.C.: Office of Technology Assessment, 1982.

U.S. Congress, Office of Technology Assessment. Information Technology and Its Impact on American Education. Washington, D.C.: Office of Technology Assessment, 1982.

Turning to the specific effects of both history and current changes on education for information professionals, the following references are of value:

Anderson, J. D. Education and Training in Indexing for Document and Information Retrieval. New York: American Society of Indexers, 1982.

Bobinski, G. S. "Current and future trends in library and information science education" (papers presented at the Library Education Centennial Symposium, Columbia University, June 1986 special issue), Library Trends 34(Spring) 1986, 535-788.

Boehm, E., and Buckland, M., eds. Education for Information Management: Directions for the Future. Record of a conference co-sponsored by the Information Institute, International Academy at Santa Barbara, and the Association of American Library Schools, May 6-8, 1982. Santa Barbara, California: International Academy at Santa Barbara, 1983.

Bookstein, A. "Library education in the university setting," Library Quarterly 56(4) 1986, 360-369.

Borko, H. "Information and knowledge worker productivity," Information Processing and Management 19(4) 1983, 203-212.

Cronin, B. The Education of Library/Information Professionals: A Conflict of Objectives. ASLIB Occasional Publication No. 2. London: ASLIB, 1982.

Cronin, B. Innovation and Curriculum Development: An International Review of Trends in Library and Information Science Education. London: ASLIB Research and Consultancy, 1983.

Cronin, B. "Post industrial society: Some manpower issues for the library/information profession," Journal of Information Science 7(1) 1983, 1-14.

"Current and future trends in library and information science education," Library Trends 34(Spring) 1986.

Debons, A., et al. The Information Professional: Survey of an Emerging Field. New York: Marcel Dekker, 1981.

Post, V. Occupations in Library and Information Science. Washington, D.C.: U.S. Government Printing Office, 1982.

Saracevic, T. "Time for divorce," Bulletin of the American Society for Information Science 8(5) 1982, 32.

It is important to recognize that education for library and information science has worldwide importance. In many respects, there has been greater recognition of the significance of the "information economy" in other countries -- the Organization for Economic Cooperation and Development, Japan, and the Scandinavian countries -- than there has been in the United States. Developing countries have been especially concerned about these issues. The result has been a significant international literature on education in the field, including the following:

Agada, J. "The search for an appropriate level of training for practicing librarians in developing countries: The Nigerian experience," Journal of Librarianship 17(January) 1985, 31-48.

Aguolu, C. C. "The future of education for librarianship in Nigeria: Problems and expectations," Libri 35S 1985, 260-273.

Bouazza, A., and Nimer, R. "Library education in Tunisia and Jordan: A comparative study," International Library Review 18 1986, 5-14.

Bowden, R. "Education for librarianship at the grassroots level: A report of the IFLA pre-conference seminar, Nairobi, 13-18 August 1984," IFLA Journal 11(2) 1985, 129-133.

Hipgrave, R. "Developments in information technology and their significance for education and training in library and information work (transcript of a talk given at a meeting of the Local Database Forum in Wellington in June 1985)," New Zealand Libraries 44D 1985, 229-231.

Lane, N. D. "Librarianship: A profession in context," in The Library Work-force: Proceedings of a Conference, 12g, 157. Sydney, Australia: LAA, 1983.

Lane, N. D. "Education for information professionals in Australia," Journal of Education for Library and Information Science 25(Spring) 1985, 326-332.

Lesokhina, V. S. "Problems of training library personnel in the USSR" (paper delivered at the 1984 IFLA conference), Journal of Education for Library and Information Science 25(Winter) 1985, 200-206.

Library Association. The Impact of New Technology on Libraries and Information Centres. Library Association Pamphlet 38. London: Library Association Publishing Limited, 1982.

Lin, S. C. "Historical development of library education in China," The Journal of Library History, Philosophy and Comparative Librarianship 20(Fall) 1985, 368-386.

Maack, M. N. "Library education in Francophone Africa," Journal of Education for Library and Information Science 25(Summer) 1984, 51-54.

Musavi, N., and Harvey, J. F. "The design of a graduate introductory information science course: A case study," Pakistan Library Bulletin 15S-D 1984, 34-45.

Ontario Ministry of Colleges and Universities. Provincial Competence Guideline: Library Technician. Ontario: Her Majesty the Queen, 1982.

Rochester, M. K. "Library and information personnel planning in Australia," International Library Review 16(4) 1984, 387-391.

Shu, F. C. "Information science education in China," Journal of Education for Library and Information Science 25(Winter) 1985, 226-229.

Thuraisingham, A. "The part-time post-graduate diploma course in library and information science -- the Singapore experience," Singapore Libraries 14 1984, 63-66.

Van Wijk, C. J. "Library policies and strategies in the Netherlands," IATUL Proceedings 17 1985, 5-15.

Vaverka, R. The Educational Needs of Information Professionals Within the Information and Documentation Area (Swedish). Stockholm, Sweden: 1983.

Ward, P. L. "Developing education programmes in the most isolated city in the world" (paper given at the seminar Research in Education, Library and Information Science), Library Association Record 87(May) 1985.

Assessment

Turning to the issue of assessment of library and information science education, one reference, the ALA's 1972 Standards for Accreditation, is absolutely crucial, since it serves as the formal statement of current requirements for accreditation of programs in the field. A means of evaluation (of some controversy) is "competency-based." The recent King study is largely dependent upon that concept, and the following are important references:

Anderson, J. D. The Development of a Competence-Based Curriculum in Library and Information Studies: The Rutgers Experience. New Brunswick: Rutgers, the State University of New Jersey, Department of Library and Information Studies, July 1983.

Auld, L. W. S. "The King Report: New directions in library and information science education," College and Research Libraries News 48(4) 1987, 174-179.

Baxter, B. History and Analysis of a Competence Based Examination for Health Sciences Librarians. Dissertation submitted to the faculty of the Graduate Library School in candidacy for the degree of Master of Arts. Chicago: University of Chicago, 1982.

Blank, W. E. Handbook for Developing Competence Based Training Programs. Englewood Cliffs, New Jersey: Prentice Hall, 1982.

Daniel, E., and Ely, D. P. "Competence based education for school library media specialists," Journal of Education for Librarianship 23(4) 1983, 273-278.

Griffiths, J. M. "New directions for library and information science education," Journal of Education for Librarianship 24(1) 1983, 48-50.

Selection Consulting Center. Library Selection Project, Job Analysis Report Phase I. Sacramento, California: Selection Consulting Center, 1977. (With appendix: Library Selection Presentation to American Library Association, 1978.)

White, H. S. "Defining basic competencies," American Libraries 14(8) 1983, 519-525.

A most important provision of the 1972 Standards for Accreditation requires that schools seeking accreditation for their programs describe the extent to which they recognize the policy statements of relevant professional societies. Unfortunately, with only a few exceptions as noted here, the societies do not have such statements. It was in part for this reason that the ALA undertook a study to explore means for cooperation with other societies in the accreditation process.

The report of that study cited in the Bibliography above (reference 7) is a critical current reference. In addition, the following references present views of a few professional societies that can be used in formulating program goals, objectives, and curricula:

Allen, M. L., and Bush, M. A. "Professional education for youth services librarians: A preliminary," Top of the News 42(4) 1986, 423-425.

American Library Association, Office for Library Personnel Resources. "ALA, the MLS, and professional employment," American Libraries 14(11) 1983, 743.

Association of Research Libraries, Office of Management. Professional Development in ARL Libraries. SPEC Kit #86. Washington, D.C.: Association of Research Libraries, 1982.

American Association of School Librarians, Certification of School Media Specialists Committee. Certification Model for Professional School Media Personnel. Chicago: American Library Association, 1976.

American Library Association. Library Education and Personnel Utilization. Chicago: American Library Association, 1976.

Association of Records Managers and Administrators, Inc. ARMA Standards: Program Job Description Guidelines. Prairie Village, Kansas: ARMA, 1983.

Christensen, B. "Responsibilities and training of records employees," ARMA Quarterly 16(1) 1982, 40-47.

Medical Library Association. Certification Examination for Health Sciences Librarians. Chicago: Medical Library Association, 1981.

Medical Library Association. MLA Requirements for Certification for Health Sciences Librarians. Chicago: Medical Library Association, 1979.

National Librarians Association. A National Board of Certification for Librarians: Position Statement on Certification of the Professional in Library and Information Services. Draft Proposal (with appendix). National Libraries Association: 1983.

Pfister, F. C. "Competencies essential for school media specialists," Journal of Education for Librarianship 23(1) 1982, 29-42.

Pfister, F. C. "Roles and essential competencies of media specialists," in Media at the Center, ed. K. H. Hug. Proceedings of the 11th Annual Conference for Continuing Professional Development, April 16 and 17, 1982.

Special Libraries Association. Professional Development Programs Handout. New York: Special Libraries Association, 1983.

A reference of exceptional importance is the statement from the U.S. Office of Personnel Management concerning their view of requirements for professional librarians in federal government:

U.S. Office of Personnel Management. Proposed Final Standards for Library-Information Service Series GS 1410. Washington, D.C.: Office of Personnel Management, Office of Standards Development, 1982.

The Market for Professional Librarians

Certainly one of the most effective means for assessment of programs for education of librarians and information professionals is the market. It is represented in the literature by statements from employers, by statistics on employment, by brochures from the professional societies for recruitment, and by scholarly reviews of the market, including the following:

Advisory Council on Evaluation and Promotion of Connecticut Libraries. Minimum Requirements for Appointment to University Librarian Ranks at the University of Connecticut Libraries. Storrs: University of Connecticut Library, 1982.

Albertson, C. "Advancing by degrees: Should public library administrators have MBAs? MPAs? Or none of the above?" American Libraries 14(1) 1983, 25-26.

American Library Association, Office for Library Personnel Resources. Library and Information Careers in the 80s. Chicago: American Library Association, 1983.

Battin, P. "Developing university and research library professionals: A director's perspective," American Libraries 14(1) 1983, 22-25.

Cooper, M. D. "What the numbers say: A statistical portrait of librarians." American Libraries 7(6) 1976, 327-330.

Horton, F. W. "The emerging information counselor," Bulletin of the American Society for Information Science 9(5) 1982, 16-19.

Learmont, C. L., and Van Houten, S. "Placements and salaries 1981: Still holding," Library Journal 107(17) 1982, 1821-1827.

Learmont, C. L., and Van Houten, S. "Placements and salaries 1982: Slowing down," Library Journal 108(16) 1983, 1760-1766.

Learmont, C. L., and Van Houten, S. "Placements and salaries 1983: Catching up," Library Journal 109(16) 1984, 1805-1811.

Lenzini, R. T. "Viewing the MLS from the vendor's perspective," Illinois Libraries 67(May) 1985, 494-495.

Martin, S. K. "Library education: An administrator's view," Library Journal 111(3) 1986, 115-117.

Mayeski, J. A., and Sharrow, M. "Recruitment of academic library managers: A survey," Journal of Academic Librarianship 3(July) 1982, 151-154.

Nenfeld, M. L., and Cornog, M. Abstracting and Indexing Career Guide. Philadelphia: National Federation of Abstracting and Indexing Services, 1983.

Nunamaker, J., and Konsynski, B. "MLS education in the U.S.: Private sector experiences and public sector needs," Computerized Environment Urban Systems 7 1982, 129-139.

Setterinton, K. "The PhD in library administration: A report of research," Library and Information Science Research 5(2) 1983, 177-194.

Smith, C. "The employment market: Do graduates' qualifications meet employers' expectations?" Canadian Library Journal 43(October) 1986, 299-301.

Spivaca, J., ed. Careers in Information. White Plains, New York: Knowledge Industry Publications, 1982.

Van House, N. A. "The return on the investment in library education," Library and Information Science Research 7(January) 1985, 31-52.

Van House, N. A., et al. "Librarians: A study of supply and demand," American Libraries 14(6) 1983, 361-370.

White, H. S. "Employer preferences and the library education curriculum," The Library Quarterly 55(January) 1985, 1-33.

Means for Providing Education for Library and Information Science

Formal degree programs at both the undergraduate and graduate level, continuing education programs, internships and residencies, and in-house library training programs exemplify the range of contexts for education. In each of them, issues of goals and objectives, curricula, faculty, students, and resources apply; they do so with varying significance, perhaps, but in each case the means for providing education become the ultimate focus of attention. The literature is filled with discussion of these issues; the following are simply those that raise the ones of principal concern for this paper:

Biggs, M. "Who/what/why should a library educator be?" Journal of Education for Library and Information Science 25(Spring) 1985, 262-278.

Blake, M. L. "Generic elements in an undergraduate course in information study," Journal of Information Science 11(1) 1985.

Chrisman, L. G. "The extent and nature of course evaluations," Journal of Education for Librarianship 24(2) 1983, 89-105.

Clarkson, S. H., and Zecher Troop, F. "Education for technical service librarians," Technicalities 2(10) 1982, 12-14.

Crary, R. L. "Foreign languages and the librarian," Journal of Education for Librarianship 23(2) 1982, 110-124.

Cronin, B., and Martin, I. "Social skills training in librarianship," Journal of Librarianship 15(2) 1983, 105-122.

Davidson, D., and Roberts, N. "Curricula in schools of librarianship and information studies," Journal of Documentation 41(3) 1985, 156-164.

Dougherty, R. M., et al. "A nexus of education and practice: The residence program at the University of Michigan," Library Journal 111(3) 1986, 118-130.

Dougherty, R. M., and Lougee, W. P. "Research library residencies: A new model for professional development," Library Journal 108(1) 1983, 1322-1324.

Galvin, T. J. "The case method in library education reconsidered," in Reference Services and Library Education: Essays in Honor of Francis Neel Chaney, 225-236. Lexington, Massachusetts: Lexington Books, 1983.

Hayes, R. M. Profile of Curricular Organization of Schools with ALA Accredited Programs: Frequencies for Required and Specialized Courses. Unpublished. Los Angeles: GSLIS/UCLA, 1983.

Hayes, R. M., and Summers, F. W. "Two-year library school programs: Useful extension or waste of time?" American Libraries 14(9) 1983, 619-620.

Heim, K. M. "The changing faculty mandate," Library Trends 34(4) 1986, 581-606.

Henderson, M. E. P. "A prairie picture of continuing education needs," Canadian Library Annual 39(1) 1982, 21-24.

Hurt, C. D. "Library school faculty strengths in data processing: Canadian-U.S. differences," Information Processing and Management 21(2) 1985, 157-163.

Kingsbury, M. "How library schools evaluate faculty performance," Journal of Education for Librarianship 22(4) 1982, 219-238.

Machalow, R. "Required courses for professional librarians," The Unabashed Librarian 50(18) 1984.

Mancall, J. C. "An overview of research on the impact of school library media programs on school libraries, Media Quarterly 14(1) 1985, 33-36.

Maxwell, M., and Finlayson, N. "A most necessary discipline: The education of technical services librarians," Library Resources and Technical Services 29(July) 1985, 239-247.

Merchant, M., and Wilson, C. "Developing joint graduate programs for librarians," Journal of Education for Librarianship 24(1) 1983, 30-37.

Piternick, A. B. "Research -- a national need," Canadian Library Journal 43(5) 1986, 277-279.

Plaiss, M. "Teaching online searching," Kentucky Libraries 49(Spring) 1985, 20-21.

Saye, J. D. "Continuing education and library school faculty," Journal of Education for Librarianship 24(1) 1983, 3-16.

Turner, C. "Undergraduate courses in library and information studies," Library Association Record 88(March) 1986, 139-140.

Watson, P. D. "Production of scholarly articles by academic librarians and library educators," College and Research Libraries 46(4) 1985, 334-342.

Weingand, D. E. "Librarians' personal continuing educational planning," Public Libraries 21(1) 1982, 13-16.

Wells, N. B. "Requirements and benefits for academic librarians: 1959-1979," College and Research Libraries 43(6) 1982, 450-458.

Wright, J., and Zweizig, D. A Study of Continuing Library Education in North Carolina. Raleigh: North Carolina State University, 1982.

Comments by Reviewers

The three reviewers who commented on this article addressed the issues of the interdisciplinary degree, theory and practice, and core curricula. They also suggested alternative approaches to the topic area, additional courses of investigation, and additional research objectives.

Interdisciplinary Degrees and Coursework

Hayes mentions the role of information science in library/information schools and other academic programs, and the library school's distance from the central mission of the university is also considered. These issues are part of the larger need to determine the placement of information science within the disciplinary structure of the university. Several fields claim aspects of information science as their own, and each can argue its case -- including librarianship. Information science in conjunction with other fields may be closer to the central mission of the university than is information science allied with library science. Research could identify whether a new discipline or new progression is growing from these several information science nodes, and the implications for library/information science programs.

He also discusses the interdisciplinary components of library education. How diverse can these programs become? How much time will be needed to complete the degree? Can library educators come to closure on course content? Do universities see the training of information professionals in schools of business, computer science, or engineering? If library education is to survive, must the interdisciplinary components of that education be given greater consideration?

Hayes has looked at each level of academic preparation separately. It would be helpful to consider them on a continuum, to see whether the separations of knowledge, skills, and abilities for practice are in line with what is taught at each level. We may find that part of what is in the Masters program belongs in technical preparation, or that post-Masters study belongs in the Masters program.

Along the same line, research is recommended to elucidate the reasons for the rise in library school closings: Is it that this type of professional degree is not considered as important as others? Although most universities have stated that library schools were closed because they were too expensive to support, were there other reasons? In the information age, why close an agency that produces these professionals? The question that arises again is whether library school programs fit into the mission of the university.

By closing library schools, the universities have sent several messages. For instance: How does the quality of research in library schools compare with that in the university as a whole? What must we do to improve the image? Library schools with doctoral programs emphasize research; library schools with a terminal Masters degree emphasize service. Is there some way to incorporate service into the goals and mission of the university without jeopardizing research?

Theory and Practice

Research is needed that would establish how much theory is appropriate and how much practice the new graduate should have. As the markets for information professionals broaden and the knowledgebase expands, are different balances of theory and practice needed for different specializations? The needs of the library professional are extensive and run the gamut. Should greater emphasis be placed on the role of research on both the Masters and doctoral levels?

Core Curricula

One of the problems facing library school educators is that they do not appear to know for what type of professional experience they are educating their students. Although Hayes believes that we expect our graduates to find positions in libraries, we also try to prepare our students to work in any type of information agency. Research that could establish a core curriculum to meet all the needs of this eclectic environment would be beneficial. Must we change the requirements for admission to the program, and must the content of this program be changed dramatically? Should students be required to enter the program with backgrounds in computer science, accounting, statistics, or communication? Or should they be encouraged to acquire these courses at the graduate level in addition to the other requirements for the degree?

Education and Training of Librarians

Another important question is the effect of information science on library school programs. To what degree should the student be required to master new technologies? Most can learn some of the applications, such as retrieving information online, but must students also know how to convert data to machine-readable format? Must they know linguistics? Ergonomics? How extensive should library school curricula become? Can we anticipate educating a different breed of librarian?

Additional Research Objectives

- Is it possible that libraries will become elitist centers for the scholarly? Should we be educating the scholar librarian? Will subject degrees in addition to the Masters in library and information study be a standard for entrance into some programs?
- Because of the complexity of information, will there be a tendency to use a greater number of paraprofessionals? Should library schools be responsible for setting standards for paraprofessional education?
- What are the future functions of library/information professionals, and how can the library curriculum met the needs of the profession?
- Are there different types of specializations required (as with engineers -- civil, mechanical, etc.) in educating librarians? At a minimum, should there be greater emphasis on educating technologists and managers? Is there a need for a diversity of programs?
- Should minimum quantitative standards be developed for library school education, such as the number of faculty, budget requirements, and physical needs?
- To what extent should library education be responsible for the lifelong learning needs of the profession?
- The need exists to study effective ways to recruit outstanding minority students into our profession, as they are very much underrepresented in librarianship. Many more are needed to help make libraries more effective in a society that will increasingly become more multicultural and multiracial.
- The increasing cost of library/information science programs merits review. The need to purchase expensive equipment for instruction and to underwrite the cost of such items as CD-ROM or online searching greatly increases the expense of the program and may make it necessary for the schools to justify their value to the universities of which they are a part. Cost studies of programs and program options in relation to other programs in the university would be an important decisionmaking tool.

- Faculty quality is critical to the educational venture. We know relatively little overall about the quality of faculty, although the site visits and self-studies required by the accreditation process may elicit this information. More research in this vein would provide answers to several important questions: Where are we getting our new faculty? What is their preparation? Where will we get the new generation of the best and brightest? Do they come from our own doctoral programs? If not, are they sufficiently socialized to librarianship to instill those values in students? If they are socialized to another discipline, what effect does this have on the integrity of the library and information science program?

EDUCATION AND TRAINING OF LIBRARIANS

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Abstract

Education and training in library and information science have made substantial advances, but many of the questions that plagued the profession decades ago continue to do so. Over the past ten years, technology has dramatically changed the roles of library professionals and support staff, and there is increased recognition that the education and training needs of the two groups differ significantly. The shaping of the future of librarianship rests not on the vocational skills necessary to the time, but on the principles common to all specializations in the field. While most librarians are able to recognize and describe requisite skills within the field, intellectual content is more obscure and subject to divided opinion. It is the intellectual content that requires attention and professional consensus; yet vocational issues continue to preoccupy the profession. As the information that librarians must master expands, vocational training will be less valuable than the intellectual foundations needed to answer the questions: What is the library doing? For whom? How? Why? How well? The profession as a whole must also focus on the educational requirements of school librarians, as there is no consensus on requirements for entrance to the field. This paper considers education and training issues for librarians that will constitute a research agenda for the next decade.

Introduction

> Every profession is a blending of theory and practice, a science and an art, *wissen und können*, to understand and to know how. Both of these elements are essential, both must be maintained in a harmonious and proper relationship.
>
> -- Jesse Shera[1]

Librarianship as it is practiced and librarianship as it is taught are mutually dependent. Schools of library and information science determine who enters the field. Libraries make jobs attractive intellectually and economically, hire the beginners from library schools, and seek to entice other capable people to enter the profession. Education for librarianship is preparation for the entry level. Specializations follow later and are achieved through practice and self-determined continuing education, not through internships or other carefully designed formal educational programs. Libraries hiring beginners are concerned, by and large, only about the entry-level degree and not about the courses taken to obtain the degree.[2] Unlike other professions, librarianship requires only a general foundation in the profession for entry. Specialization within the field is not required before beginning to practice.

While most librarians today would agree that a librarian is a person who has a Masters degree from a program accredited by the American Library Association, that definition still is not fully accepted outside the field and is questioned even within it. School librarians generally need only a certain number of credit hours of "library science" to be certified as teacher-librarians. The requirements of certification for public librarians differ from one state to the next. Academics debate the need for "scholars, not librarians." The federal government seeks to downgrade the position of librarian and the educational requirements for people working in federal libraries. Users of libraries often assume that anyone working in a library is a librarian. These difficulties in terms of defining a librarian are not insignificant. They influence hiring practices and educational requirements. Even discussions of research in librarianship can be influenced by definitional problems.

The purpose of this paper is to consider issues related to the education and training of librarians that will identify a research agenda for the next decade. The paper acknowledges the history of the field, for the issues have remained much the same from the last century to the present, and seeks to build on both the concerns of the past and the present realities in order to suggest an agenda for the future.

The Development of Library Education

In most large libraries, librarians -- i.e., people prepared in librarianship at the Masters level -- make up about one-third of the total staff. The other two-thirds are skilled technical assistants, clerical workers, and, in academic libraries, student workers. The training of these nonprofessionals is done in-house through informal on-the-job training programs. There are also formal educational programs for technical assistants -- 100-200 of them nationwide. Such programs have not gained widespread acceptance; rarely have they been incorporated into library hiring patterns or the civil service regulations governing the employment of nonprofessionals in most academic and public libraries.

As libraries have incorporated computer technologies into their daily operations, the technical assistant and clerical jobs have changed dramatically. Over the past ten years, the training and retraining of nonprofessional staff to accommodate their changing jobs has formed a significant part of library personnel programs. Efforts to change job specifications and civil service requirements in light of the changing nature of nonprofessional jobs have been a major concern for many library managers. The ability of the library to change these jobs in a timely fashion may be an indicator of its overall ability to change, and an indicator of the library's influence in the environment in which it operates.

While the majority of staff in large libraries are trained in-house, the professionals who manage the library, design the services, determine the collections, and monitor the environment are educated and trained in Masters degree programs. The nature of these professional degree programs influences overall library development; hence the continuing interest of the profession in the quality of faculty and student body and, to a lesser extent, the nature of the curricula at library schools. The profession has been less interested in the quality of the research emanating from the schools; the connection between good research and good librarianship has been less apparent, being less immediate. The strengthening of the research component in library schools has continued despite the genuine lack of interest among most practitioners, and it is a development of major importance. Practicing librarians are making scholarly contributions to the field while delivering services locally. Although the debate will continue as to how much knowledge the practitioner should have about research design and methodology, it is generally agreed that practitioners should have some such knowledge.[3]

In 1901, Mary Wright Plummer described the apprenticeship programs of library training that were prevalent in the 19th century: trial and error, visits to libraries acknowledged as being well run, and tuition-paid experience to work with experienced librarians.[4] Growing out of these programs were the more formal ones, the first being Dewey's school, which was founded in 1887 at Columbia. Other formal training programs were located in technical institutes (Pratt, Drexel, Armour), public libraries (Los Angeles, Denver, Cleveland), and universities (Syracuse, Maine, Chicago). These programs, like the in-house training programs for paraprofessionals today, emphasized the techniques of librarianship. All these programs were monitored by various committees of the American Library Association (ALA). By 1905, ALA's Committee on Library Training was proposing standards for training.[5]

These early efforts at monitoring library education led to the present accreditation programs of the ALA. While the profession assumes that formal library education programs are reviewed under the accreditation process of the ALA, there are several important educational programs that fall outside the ALA purview. Some of these are not reviewed by the profession at all: doctoral programs, about 25 in the United States, offered by graduate schools of the library and information science; library technician programs, offered as paraprofessional training courses at the undergraduate level; school librarian programs, usually associated with colleges of education; and the many and growing number of continuing education programs offered by libraries, professional organizations, and library schools that are not accredited or reviewed for quality by the profession. The profession has paid little attention to these programs. It has continued its criticism of the first degree programs offered by library schools, such criticism emerging as early as 1918.[6] The education for librarians in formal library programs offering the first graduate degree is the primary and continuing interest of the profession.

The shift to formal educational programs, from what had been up to then education based on apprenticeships, had its beginning with Dewey. However, the emphasis on technical training and practice continued. Only recently has a shift to greater emphasis on theory and research occurred in Masters programs, and the ALA's interest has expanded to what is now its formal program of accreditation.

The landmark report by C. C. Williamson on training for librarianship, published in 1923,[7] marked the beginning of the change in education for librarianship that has led to the present educational requirement for the librarian, the Masters degree. Williamson recommended that ". . . the professional library school should be organized as a department of a university, along with other professional schools, rather than in public libraries, state or municipal. Schools now conducted by public libraries should either take the definite status of training classes or be transferred to university auspices in fact as well as in name."[8]

The placement of the library school in the university, agreed to by the profession as important, marked the beginning of the shift in emphasis in library training from practice to theory and research, a shift that continues to this day. While the profession still debates theory and research, it is unlikely that the trend toward research will change, unless, of course, the field returns to apprentice-like training programs common in the last century, which is unlikely. Most universities are requiring faculty to increase productivity in terms of research and publication and are putting pressure on their various colleges and departments to expand the amount of external funding awarded each year. Those library schools that ignore such pressures do so at their peril, for the competitive environment within universities today is severe.

Williamson's recommendation that library education programs place greater emphasis on the theoretical aspects of the profession and on research, and less emphasis on practical matters, came 35 years after the founding of the Dewey school. Williamson's recommendations had great influence; they were a culmination of many of the improvements advocated earlier.[9] The support provided to library education by the Carnegie Corporation also was influential. Under the leadership of Francis W. Keppel, the Carnegie Corporation made grants of $1,440,000 during the 1920s and 1930s to establish some new library schools and to strengthen others. It gave the University of Chicago $1,385,000 to establish its Graduate Library School, the first program to offer the Ph.D. degree in librarianship. It provided sustained financial support to the ALA for a variety of purposes from 1926 to 1941.[10]

Despite these efforts and the general agreement that degree programs in universities are the appropriate basis for librarianship, criticisms continued.[11] In 1946, Danton surveyed U.S. library schools and made the following observations:

- The faculties were too small and generally were unable to enlarge or develop new programs.
- Too much was attempted in one-year programs.
- The library school programs were not well integrated into the university.
- Schools did not educate for leadership.
- There was too little differentiation between professional and the nonprofessional concerns in the educational programs as well as in the working environment.
- The faculties were not research oriented.[12]

While Danton's criticisms reflect the perceptions of many of today's practitioners, the data support only a few of those perceptions. In 1985, the average number of full-time faculty in the 66 schools that were members of the Association for Library and Information Science Education was 9.85; the modal faculty size was 8, still too small by most university standards. The curricula at library schools have continued to expand, with new courses being added primarily in technology and management. While longer academic programs are inevitable, students tend to prefer programs requiring 30-36 credit hours instead of 48. New knowledge in the field does not replace the old, and the continuing explosion of knowledge must be accommodated.[13]

A study by Marion Paris on the closing of library schools shows that poor leadership and isolation from the larger campus community were the major factors in the decisions to close the library schools she studied.[14] Her investigation supports, at least in four schools, Danton's observation made 40 years ago that library school programs are not well integrated into the university. As Edward G. Holley has succinctly stated:

> ". . . six decades after C. C. Williamson's report to the Carnegie corporation on training for library service, five decades after Louis Round Wilson brought the research thrust to fruition at Chicago, and three decades after the acceptance of the MLS as the entry-level qualification for librarians, we are still concerned about the isolation of library schools from other academic units on campus, the lack of research and the appreciation for research on the part of librarians, small enrollments, and poor administrative leadership."[15]

As shown in Table 1, there has been a steady improvement in the percentage of library school faculty holding the Ph.D. degree. While the data in Table 1 do not show whether faculty members are research oriented, they do show that the faculty are prepared for research through their experience in writing Ph.D. dissertations. A number of studies analyzed by Heim[16] and Tague[17] on the role of faculty research suggest a continued growth of the research thrust in library schools. Heim[18] predicts: ". . . as library and information science enters its second century it can be cautiously predicted that by objective measures the preparation of the professorate and the internalization of academic rather than field norms will contribute to the development of a professorate that is more consistently trying to seek and disseminate the truth than it has been inclined to do in the past."

Expectations of Library Staff

There is a growing understanding and recognition that the education and training of professionals working in libraries differs from that of the support staff. As librarianship has developed, tasks once thought to be professional have become routine and have been turned over to support staff. The dramatic shifts in the nature of the work done in libraries and the shift in staffing patterns to a higher ratio of support staff to professional staff have led to renewed interest in the nature of the education and training of librarians. The development of in-house training programs for paraprofessional staff, and questions asked by employees about how one moves from a paraprofessional post to a professional one, have led to a renewed interest in the statewide certification requirements for public and school librarians and a growing concern within the profession about the qualifications, education, and training of librarians. The profession, for the most part, assumes that the Masters degree is the standard for admission to the profession.

It bases that standard not just on measurable skills but also on the art of practice and on vision. The profession, through its societies and through those who educate and employ librarians, will be called upon to reaffirm that vision.

Table 1. Education of Library and Information Science Faculty 1920-1985

Years	Number of Programs	Total Faculty Surveyed	Degree	Education Percentage	(N)	Source
1920-1921	12	100	Bachelor	52	(N=52)	Charles C. Williamson, *Training for Library Service*, 1923, p. 35.
1936-1937	26	140	Bachelor	92	(N=129)	Louis R. Wilson, "The American Library School Today," *Library Quarterly* 7 (April 1937):231.
			Masters	46	(N=64)	
			Ph.D.	10	(N=14)	
1945-1946	30	148	No Degree	1.4	(N=2)	J. Periam Danton, *Education for Librarianship*, New York: Columbia, 1946, p. 10.
			Bachelor	2.7	(N=4)	
			Bachelor & BLS	29.7	(N=44)	
			Masters	48	(N=71)	
			Ph.D.	18.2	(N=27)	
1960-1961	32	168	Ph.D.	32.1	(N=54)	Raymond Kilpela, "Library School Faculty Doctorates," *Journal of Education for Librarianship* 23(Winter 1983):244.
1966-1967	38	325	Ph.D.	33.2	(N=108)	"
1972-1973	57	640	Ph.D.	46.7	(N=298)	"
1978-1979	63	689	Ph.D.	65.9	(N=454)	"
1981	69	722	Ph.D.	70.8	(N=511)	Russell E. Bidlack, "Faculty," in *AALS Statistical Report* 1981, p. F-19.
1982	69	706	Ph.D.	71.5	(N=505)	Russell E. Bidlack, "Faculty," in *AALS Statistical Report* 1982, p. F-21.
1983	68	680	Ph.D.	75.1	(N=511)	Russell E. Bidlack, "Faculty," in *AALS Statistical Report* 1983, p. F-29.
1984	66	656	Ph.D.	77.1	(N=506)	Gary R. Purcell, "Faculty," in *ALISE Statistical Report* 1984, p. F-28.
1985	66	650	Ph.D.	77.9	(N=506)	Gary R. Purcell, "Faculty," in *ALISE Statistical Report* 1985 p. F-32.

Source: Kathleen M. Heim, "The Changing Faculty Mandate," *Library Trends* 34 (Spring 1986), pp. 581-593.

Those responsible for graduate and professional education are guided by questions such as: "What levels of responsibility must the beginner assume? Will he or she be acting alone, or will fully experienced professionals be on hand to supervise? What is the level of risk involved in turning the new librarian loose in the profession?"[19] Answers to these questions, hammered out by the profession, will guide the education of librarians. They also will help to forge a research agenda.

The vocational skills needed in librarianship are changing, as they do with each generation. Miksa has eloquently described the skills in Dewey's curriculum:

> "Dewey's inclusion of library hand in his library school curriculum has long been the object of amusement. It has been spoken of in hindsight as an indication of the clerical practice, and therefore, the nonintellectual orientation of early library education. Dewey, however, was not as ignorant as this kind of judgment implies. The chief technology for bibliographic control during the 1880s was handwriting. And if that technology was to be effective, it had to be efficient and well done. This meant that some effort to control handwriting was not only useful but absolutely essential if the broader goals of the library were to be met."[20]

The shaping of the future of librarianship rests not on the vocational skills necessary to the time, but on the principles common to all specializations in the field. The profession expects library education to be built on a solid intellectual foundation. The strong vocational needs of the profession are also recognized. While most librarians are able to recognize and describe the requisite skills, the intellectual content is more obscure and subject to divided opinion.[21] It is the intellectual content that requires attention and professional consensus; yet vocational issues continue to preoccupy the profession.

Leadership is required to address the question of intellectual content and to place the vocational requirement in its proper perspective. Top managers of libraries seek librarians not so much for what they know as for what they can learn. Top managers look for people who will be able to lead libraries over the next decade or two. Middle managers, by contrast, seek instant producers. They want technicians, although that is rarely stated, for well educated technicians make the middle manager's job easier. Students and new hires want a curriculum that will lead them to a good job. Many students are thus vocationally driven, and they are vocal in their demands for a curriculum that offers job skills, not intellectual foundations. These are the difficulties facing much of library education today: too many people with varying perspectives making demands on the schools. The schools' responsibility will be to help forge the consensus of the parties concerned: the employers; the professionals; and the general public, the ultimate beneficiary.

The disagreements within the profession about the education of its members may be the reason the profession has given over responsibility for the curriculum to those schools that offer formal programs in librarianship leading to the Masters degree. In the early years of accrediting library science programs, the ALA prescribed a model curriculum. The Medical Library Association and the Special Libraries Association made attempts to influence the curricula in library schools to meet what these professional library associations believed to be essential to librarians in their specializations. The pattern now is that the schools determine the curriculum they offer. Although the ALA standards for accreditation do enable the profession, should it wish, to bring about changes in the curriculum, few attempts have been made in recent years to influence the educational programs at the Masters level. Much of this assignment of responsibility to the schools stems from the profession's inability to agree on a curriculum appropriate to the Masters degree.

Herbert White's important survey of managers of academic, public, and special libraries[22] shows little agreement within the profession, as it is practiced now, about which courses new hires should have in their Masters program. White attempted to find agreement among the academic, public, and special library managers about curriculum requirements. No track could be identified for special libraries, and two substantially different tracks for the education of new hires were identified for academic and public libraries (Table 2). There was more agreement on the core curriculum, i.e., those courses that should be required of all graduates. The core, however, was considerably smaller than one might expect (Table 3).

Each type of library, academic and public, looks for a separate course in its own specialization. The curriculum of librarianship continues to provide specialization by type of library in which the professional expects to work. There are indications, however, that this emphasis is shifting toward programs centered on the type of client served or the information function pursued instead of the institutional setting in which librarianship is practiced. Type-of-library courses appear to be offered less and less and have fewer and fewer students enrolled in them. Such changes in emphasis could have a major effect on librarianship as it is practiced in agencies called libraries. Whether the profession will take an interest remains to be seen; that it should seems a given.

Table 2. Core Curricula (Courses Given Modes of One) by Respondent Groups

Large Academic Libraries (N=34) (60 or More Professional Staff)	Medium Academic Libraries (N=38) (20 - 59 Professional Staff)	Small Academic Libraries (N=50) (4 - 19 Professional Staff)
Basic reference	Basic reference	Basic reference
Collection development	Collection development	Collection development
Personnel and human relations	Academic libraries	Literature of the humanities
	Research libraries	Literature of the social sciences
	Library management	Literature of science and technology
	Personnel and human relations	Academic libraries
	Introduction to information science	Introduction to information science
	Organization of materials - Dewey	Organization of materials - Dewey
Large Public Libraries (N=34) (60 or More Professional Staff)	**Medium Public Libraries (N=49) (20 - 59 Professional Staff)**	**Small Public Libraries (N=49) (4 - 19 Professional Staff)**
Basic reference	Basic reference	Basic reference
Collection development	Collection development	Collection development
Public libraries	Public libraries	Public libraries
Introduction to information science	Introduction to information science	
Organization of materials - Dewey		
General technical services		

Source: Herbert S. White and Marion Paris, "Employer Preferences and the Library Education Curriculum," *The Library Quarterly*, 55 (January 1985), p. 12.

Table 3. Core Curricula

Academic Libraries (N=142)	Public Libraries (N=132)
Basic reference	Basic reference
Collection development	Collection development
Academic libraries	Public libraries
Personnel and human relations	Introduction to information science
Introduction to information science	
Organization of materials - Dewey	

Note: These are courses given modes of one by at least two of three academic and public library groups.

Source: Herbert S. White and Marion Paris, "Employer Preferences and the Library Education Curriculum," *The Library Quarterly*, 55 (January 1985), p. 12.

The profession's lack of interest in the educational requirements of school librarians is troubling, particularly if it is a portent of the future. In the school library field, there are great variations. Certification of school librarians is determined in each state. Neither the ALA nor its division, the American Association of School Librarians, has tried to influence the states in any substantive or persistent way in terms of the nature of the degree, a required core curriculum, or a standard number of hours. Minimum semester hours for school librarians range from 6 required hours in South Dakota for a librarian with an enrollment of 75 pupils, to 24 in Kentucky. North Carolina is one state that requires a Masters degree from an ALA-accredited program for certification. Twenty-two states require a practicum or internship as part of certification.

There is some semblance of a general core across the states, and the movement to a competency-based program has been increasing. In a 1984 survey of school library media certification requirements, Ann Y. Franklin identified 23 different titles in use to describe a school library media specialist.[23] Lillian Gerhardt, commenting on the Franklin survey, pointed out very forcefully that the profession does not take seriously the responsibility for the education and training of school librarians. She said:

> "The American Library Association is the only nationally recognized body that can accredit programs in education for librarianship. Long ago it left requirements for school librarianship to the states' departments of education. This was a shameful default of ALA's stewardship. The proof is in Franklin's many charts -- only three states even know what to name the jobs they are certifying. And even they don't agree on the competencies."[24]

Education indeed is the responsibility of the various states. Yet the nation's attention has been turned to the matter of the quality of elementary and secondary schools and the instruction they provide. Similar attention must be paid to the quality of library services offered in these schools and to the education and training of the people who work in them. These issues are clearly ones that should be on a national agenda for librarianship. In June 1987, the ALA, at the urging of the American Association of School Libraries, decided to join the National Council for Accreditation of Teacher Education (NCATE), the purpose being to influence the school media specialist curriculum offered in colleges of education. This effort reinforces the status quo, that is, that an education degree, not a library degree, is the suitable credential for school librarians.

Perritt and Heim are among those who argue forcefully for the Masters degree awarded by a graduate program accredited by the ALA as the appropriate credential for youth services librarianship practiced in school media centers and in public libraries. They conclude: ". . . if librarianship is to maintain its hegemony in the 21st century the profession as a whole must agree to this credential as the generally accepted requirement for entrance to the field."[25] The profession as a whole has not formally agreed on its requirements for entrance to the field. Thus the definition of a librarian is locally determined.

No scientific method has been established to measure whether the MLS helps to make good librarians. One can observe the performance of librarians and evaluate it. Isolating the variables that influence the performance is more difficult. There is general agreement that library education at the Masters level makes a difference, and that libraries with well educated and well trained personnel can be distinguished easily from those without such staff. Why such distinctions emerge is not easily measured. As library techniques change with increasing rapidity, librarians will be expected to assess needs, adopt new techniques, and discard the old, while ensuring that users' requirements continue to be met. As the knowledgebase expands, vocational training will be less valuable than the intellectual foundations that help answer the questions: What is the library doing? For whom? How? Why? How well? These are the questions that are posed to each generation and require either new answers or reaffirmation of old ones. These are the questions that will continue to guide the research agenda. The assumption here is that the library will continue to be a valued social agency, and that people will continue to use it to satisfy their individual information needs.

A consideration of excellence at the institutional level leads to the question of whether libraries should be accredited. The question comes up from time to time as people grapple with the question of what makes some libraries perform (or seem to perform) better than others. This question then leads to another question: Should the excellent libraries be setting the standard for others? The question should be explored systematically. A library accreditation program could provide public library boards of trustees with the tools they need to evaluate their libraries more systematically. Accreditation would provide an incentive to correct deficiencies identified in the accreditation process. It would provide the means to assess library performance against an agreed-upon standard. Academic libraries now are evaluated as part of an institution's general accreditation; sometimes they also are included in the evaluation of a specialized academic program such as engineering, psychology, or social work.

The question of accreditation of libraries leads to issues of library standards. The profession develops standards for libraries periodically. The current trend is to write standards in terms of the institution's own goals and objectives. This approach denies the profession any true standard of its own. Some movement away from self-set standards is emerging; whether it will continue is not clear.

Education and Training of Librarians

In terms of the trust of the Masters degree programs, the programs will continue to include some vocational training; they will emphasize more and more, however, theory and research. Grotzinger found in a survey of 62 North American library schools that only four did not have a course in research methods.[26] The intellectual foundations of librarianship will continue to be explored. The universities in which library schools are placed will demand it even if the program itself does not. Faculty members will be expected to do rigorous research. One of the questions posed by universities as they review all academic programs, including library schools, is whether the faculty can meet the research standards set by the university. If the answer is "no" or "not likely" the school becomes very vulnerable. Serious questions for the profession as a whole are: Where is the faculty to come from? And, will they keep coming? The IIB fellowship program of the federal government, mounted in the 1960s, provided a new cohort of library faculty and senior library managers. Will a new group emerge to replace them in the 1990s? Will they come without the support of government or private philanthropy? Will they be educated and trained to conduct rigorous investigations of meaningful value to the profession? The 1985 ALISE data show that 33.7% (N=220) of all library school faculty are over the age of 55. The doctoral enrollment in North American schools was holding steady at 290 full-time equivalent enrollment.

Research in Librarianship

Research in librarianship consists of practical problem-solving studies, those that are explanatory, and predictive investigations leading to theoretical models. The research base is grounded in the social sciences, much of the theory being derived from other fields. Shera has pointed to four major categories of research: library administration, knowledge and society, education and communication, and man-machine relationships.[27] These categories encompass most of the studies in librarianship today.

Much of the research in librarianship is applied research, that is, investigations that seek to improve the services provided in libraries. As one author puts it, "Library science is an applied field and not a basic branch of knowledge. Society does not care for a better theory and greater knowledge of libraries per se. The only reason that better theory and greater knowledge of libraries is desirable from society's vantage point is that more effective and/or efficient library service will flow therefrom."[28]

Tague has likened applied research to research into problems of a particular institution or group of institutions, and has identified surveys of the characteristics and requirements of user groups, standards for bibliographic control, and the use of technology in various contexts as examples of such applied research in the field. Basic research in Tague's view is investigation into the general nature of information and into the social role of libraries.[29]

With this distinction between basic and applied research in librarianship, it is easy to see why many observers suggest that research in librarianship should emanate from practice, and that the practitioner should determine the kind of investigation that would be fruitful. Whether such investigations are cumulative or whether they lead to theory construction or the development of models is of less interest than the answers to practical questions of local interest.

A debate over basic versus applied research or who should do research, the practitioner or educator, is of less interest than the research questions themselves. In identifying significant questions being asked routinely in the field, the continuum of applied to basic research becomes apparent. In reviewing some of the research questions, two major problems are apparent if basic research is the ultimate aim: the need for large amounts of money to do organizational research and the need for national statistical data that are collected systematically and regularly use the same definitions. Without money and statistical data, the field will continue to limp along with studies that can only suggest broad applications or model development.

The following list of research questions takes some of the issues raised in this paper and identifies the applied research question and the basic research studies that could be derived from the applied question.

Applied Research Question	Basic Research Investigations
What is the influence of civil service rules and regulations on library administration?	Studies of public policy on employment in the not-for-profit sector.
Do in-house training programs influence the job skills of librarians?	Comparative studies on human resource programs as they vary by discipline.
What is the influence of the library in the larger context of its organizational environment?	Comparative studies of organizational environments and variations in the power of organizations.
How has the introduction of computer technology influenced the organization of libraries?	Comparative studies of organizational structure as influenced by technology, size, and other variables.
Will those elementary and secondary schools with librarians who have Masters degrees in library science have better libraries than schools where the librarians do not have such degrees?	Comparative studies of the quality of elementary and secondary education and identification of significant variables.
Is the library a valued social agency?	Studies of public policy issues: How is policy determined? By whom? For whom?
Why are some libraries better than others?	Studies of methodology issues: How can variations in organizational performance be measured?
What information do people need? How do they search for information? Do librarians help?	Studies of the role of the professional librarian as intermediary. Comparative studies of various professions with regard to the ways in which professionals interact with clients.

What do people read?	Replication of earlier studies on reading. Comparative studies on reading in relation to reading environments.
Who uses online texts? For what purposes? How do they access online material?	Comparative studies of scholarly communication in different disciplines. Replication of earlier studies on relevance and recall.
What is the nature of library collections? Do they reflect local community interests?	Comparative studies of library collections in terms of homogeneity and in terms of whether the collections reflect local variations.

Summary

Research is an important component in the field of library and information science. Local studies can provide answers to particular questions or offer solutions to vexing problems. Such studies, with their base in applied questions, lead directly to more basic issues.

The field as it is taught and the field as it is practiced could profit enormously from large-scale comparative studies of libraries in relation to other kinds of organizations. Librarians can learn much from large-scale comparative studies of organizational structure. Issues of public policy are of great interest to most librarians. In recent years, few investigations, basic or applied, have been undertaken in the area of libraries and public policy; more are needed.

To further the development of the research base in library and information science, funds are needed to conduct more than local studies. Well designed and well executed large-scale investigations of libraries cannot be done with a few thousand dollars; they take many thousands. Reliable statistical data also are needed. Such data would provide comparative, analyzable data offering researchers opportunities for more than just local analysis of data at a particular point in time. At present, we have few data that are comparable longitudinally; definitions have changed each time national data have been collected.

A continuing interest is to take the applied questions so important to the provision of efficient and effective local library service and put them into the larger context of basic research. Generalizations, model building, and theory construction coming from such research would strengthen enormously our knowledge of libraries, information, and the users served by librarians.

Notes and Bibliography

1. Shera, J. H. The Foundations of Education for Librarianship, 201. New York: John Wiley & Sons, 1972.

2. Robbins-Carter, J., and Seavey, C. A. "The Master's degree: Basic preparation for professional practice," Library Trends 34(Spring) 1986, 561-580.

3. Grotzinger, L. "Characteristics of research courses in Masters' level curricula," Journal of Education for Librarianship 17 1976/1977, 85-97.

4. Plummer, M. W. "Training for librarianship," Library Journal 26(June) 1901, 317.

5. Vann, S. K. Training for Librarianship Before 1923: Education for Librarianship Prior to the Publication of Williamson's Report of Training for Librarianship. Chicago: American Library Association, 1961.

6. Henry, W. E. "Qualifications of the teacher in library schools," Public Libraries 23(March) 1918, 113-115.

7. Williamson, C. C. Training for Library Service. A Report Prepared for the Carnegie Corporation of New York. New York: Carnegie Corporation, 1923.

8. Ibid., 142.

9. Churchwell, C. The Shaping of American Library Education, 27. Chicago: American Library Association, 1975.

10. Holley, E. G. "One hundred years of progress: The growth and development of library education," ALA Yearbook 1986, 26. Chicago: American Library Association, 1986.

11. Heim, K. M. "The changing faculty mandate," Library Trends 34(Spring) 1986, 581-593.

12. Danton, J. P. Education for Librarianship, Criticisms, Dilemmas, and Proposals, 6-8. New York: Columbia University Press, 1946.

13. Association for Library and Information Science Education. Library and Information Science Education Statistical Report 1985. State College, Pennsylvania: ALISE, 1985.

14. Paris, M. Library School Closings: Four Case Studies. Ph.D. Dissertation, Indiana University, 1986.

15. Holley, E. G. "Does library education have a future?" American Libraries 17(October) 1986, 702-706.

16. Heim, op. cit.

17. Tague, J. "The role of research in information and library education," in *Education of Library and Information Professionals: Present and Future Prospects*, 121-134. Littleton, Colorado: Libraries Unlimited, 1987.

18. Heim, *op. cit.*, 603.

19. Elliott, L. H. "Some observations in graduate and professional education," in *Extended Library Education Programs*, 11-22. New York: Columbia University School of Library Science, 1980.

20. Miksa, F. L. "Melvil Dewey: The professional education and his heirs," *Library Trends* 34(Winter) 1986, 379.

21. Swanson, D. R., ed. *The Intellectual Foundations of Library Education*, 1. Chicago: University of Chicago Press, 1965.

22. White, H. S., and Paris, M. "Employee preferences and library education curriculum," *Library Quarterly* 55(January) 1985, 1-33.

23. Franklin, A. Y. "School library media certification requirements: 1984 update," *School Library Journal* 30(January) 1984, 21-34.

24. Gerhardt, L. "What is a name? Think about it," *School Library Journal* 30 (January) 1984, 11.

25. Perritt, P. H., and Heim, K. M. "ALA-accredited Master's degree: Consideration for youth services librarians," *Top of the News* 1986(Winter).

26. Grotzinger, *op. cit*.

27. Shera, *op. cit*.

28. Shearer, K. "The impact of research on librarianship," *Journal of Education for Librarianship* 20 1979/80, 114-128.

29. Tague, *op. cit*.

Comments by Reviewers

The three reviewers who commented on this paper discussed the issues of research support and continuing education. They also suggested alternative approaches to the topic area, additional courses of investigation, and additional areas for research.

Research Support

Research is needed that addresses how we *as a profession* can improve the research infrastructure in library schools, libraries, and other related organizations and groups. Given the small size and minimal budgets of most library schools, significant up-front money is needed to provide support for research activities. Faculty who teach 3 classes of 25 students each (with one class having a lab) are unlikely to participate in much research. Modern equipment to support research is desperately needed, and only limited research can be expected from libraries if they lack a research infrastructure.

There is a growing perception on the part of a number of social scientists that large-scale generalizations in the social sciences may be both inappropriate and impossible (see David Drathwohl, Social and Behavioral Science Research, and Yvonna Lincoln and Egon Guba, Naturalist Inquiry). A recent work by Hubert Blalock, entitled Conceptualization and Measurement in the Social Sciences, suggests the difficulties of producing generalized laws in the social and behavioral sciences. For years we have had the mandate to produce general research for library science, and we are not much better off now than 25 years ago. Perhaps the field should reconsider the appropriateness of the hard sciences research model for library "science" and recognize that research which includes human subjects is fundamentally different from that done in the physical sciences. New and innovative models for research in library sciences may be both necessary and appropriate before significant research advances are made.

Lynch notes the existence of 25 doctoral programs; research is needed to identify the quality of these programs and the individuals engaged in research. How competent is our profession to conduct the research needed? Is it time to "accredit" the quality of our doctoral programs? It will be difficult to move forward to improve the research basis of the field with poor or inadequate doctoral programs and faculty. A paper by Pauline Wilson in the Journal of Library Education (in the mid to late 1970s) explores issues related to poor research performance by library educators.

Continuing Education

A key issue to be dealt with is the anti-intellectual position that the profession takes toward the importance of research and ongoing education. It should be recognized that there is no recertification of professional academic and public librarians in the United States; there are also minimal rewards for many librarians to obtain additional education or research skills. School librarians and medical librarians are required to engage in lifelong learning to maintain their professional status; academic and public librarians do not have such requirements. Does the lack of such requirements affect the profession's ability to provide leadership in an "information age"?

Along the same line, is there a way to test the effectiveness of continuing education on the quality of performance that an employee displays? A research issue of importance would be a comparison of how other professions take into account the emphasis on continuing learning in preservice education, and how well preservice education prepares graduates to be lifelong learners.

Comparative studies of the ways in which outstanding library schools assist their graduates would also provide examples to be emulated, as the professional school has responsibility to assist its graduates to continue learning throughout their professional careers. Each school needs to offer services adjusted to the individual needs of its graduates in order to help them deal with changing developments in society, in the profession, and in career patterns.

Additional Research Objectives

- Lynch makes the point that the profession has given the responsibility of curriculum development to the educators, since the practitioners can reach no agreement. The key issue is how we can better coordinate responsibilities for both curriculum development and the conduct of research. What mechanisms can be suggested? Researchers and practitioners are currently unable to communicate knowledgably with each other.

- Research comparing the human resources approaches of other professions could provide guidance for librarianship. For example, how do other professions select and recruit new employees? How do they develop potential leaders during preservice education? What are the distinguishing characteristics of past and current leaders in the library profession itself?

- An important issue is the lack of a research base within the profession to document how libraries affect people's lives, and how they help promote more active learning environments which can prepare students for lifelong and active citizenship.

- What evidence exists on the social effects of reading? As the newer media seemingly eclipse reading for many people, what is the new place of the printed word? What is the relationship between the characteristics of documents and their usefulness? How does the use of information vary by discipline? How do or should changes in scholarship in various disciplines affect library holdings and services?

- A research partnership between libraries and other schools is necessary to break the campus isolation of library schools and foster dynamic linkages among library school faculty, other faculty and researchers, and practitioners. Even more importantly, our profession could begin to make its own significant contribution to the improvement of education. Adequate training in research is necessary to make this possible.

- Studies are needed on ways in which the library and information professions might work together in the service of the public, how resources could be shared, and how principles and methods used in other professions might be used to solve problems.

RESEARCH ISSUES IN INFORMATION ACCESS

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Abstract

In the past, access to information has been a matter of both ascertaining the existence of a book or journal article and determining its location and availability. Access in the 1990s will take on an added dimension. Information technology already has the capability to address the existence, location, and availability of information through the files of the Online Computer Library Center (OCLC), Research Library Group (RLG), Bibliographic Retrieval Services (BRS), DIALOG Information Service (DIALOG), and other online sources. What we cannot yet do is look inside the traditional media at their contents, nor can we effectively browse the contents of full-text files. Access is also affected by the economics of the marketplace: What pricing models are appropriate for the 1990s? How can producers, distributors, and users fit into them? These questions require investigation, particularly if the goal is to establish the library as a driving force in the creation and distribution of information, rather than a passive consumer of it. Issues of access reveal how strongly the library world interfaces with technologically dynamic sectors such as computing and artificial intelligence, and point up the need for an expanded program of research in library and information science. Such a program will require changes in institutional structures and graduate curricula as well as in professional philosophies.

Introduction: The Safety of Traditions

Access, in information handling terms, must include the concept of usability. Having a physical volume in hand or text on a screen does not necessarily mean that the information contained therein is accessible. This essay explores the issue along two paths: first, the need to create deeper and richer intellectual access routes; and second, the ability to deliver the resultant information segments or subunits through the use of new technologies.

In the Library of Congress Subject Headings, "Access to Information" has a "see" reference to "Freedom of Information." Although one can understand its logic, the relationship is narrow and limited. Open stacks allow physical access to a physical medium -- an issue that is quite separate from the problem of intellectual access to the relevant content of the medium. While not disregarding the importance of physical access issues, this essay focuses on interpreting the information structures we have lived with for centuries, and on their continuing importance in the electronic environment, keeping in mind that access to information is a user problem more than it is a librarian problem.

Conventions devised for access to information can be traced back to the efforts of the Sumerians. Pagination, white space, margins, and punctuation essential to scanning information were known as early as 5,000 years ago, and by the third century A.D., the book, in much the same form we know today, was in regular use.[1] Mnemonics and structures to assist in the memorization of the calligraphic symbols of Mesopotamia already began to give shape to the organization of information. As early as 500 B.C., the Chinese developed schemes for the organization of printed material. Based on concepts of organization and arrangement, as well as presentation and format, the book assumed a form recognizable across time and cultures.

While automation (or "information technology" in current terminology) has opened up new opportunities for access to information, its direct effect has mainly been to speed up access along wholly traditional lines. Our profession was caught relatively off guard by the fast-paced development of automation. Only through heroic efforts of individuals such as Henriette Avram were we led, in the early 1960s, to understand and accept the need for standards. The result was the development of the Machine Readable Catalog (MARC) formats, making possible virtually all our computer-based accomplishments. They still underpin advanced work such as that being done on the Linked Systems Project (LSP).[2]

Automation: A Tool for Opening and Closing Access

While the profession as a whole welcomed automation as a way to relieve workers of the tedium of manually searching for copy and typing cards, it failed to grasp the longer-term potential for far-reaching change. Individuals -- patrons, users, clients -- for their part, began to sense a way out from under the burden of cumbersome and complicated information searching. An adventurous few began to develop their own highly relevant and personalized information files, where citations were accessible under key words that made sense to them, and texts from several sources were mixed and blended to serve an individual need. These individuals also began to demand changes in the way information was organized and retrieved in the library context, knowing from their own experience that there were alternatives.

Why have libraries doggedly marched along a narrow path, not daring many experiments? Among the possible answers are the following:

- Centuries of tradition weigh heavily and have, with little doubt, cast over the profession a reluctance to change. On the other hand, caution has prevented mistakes while automation is far from a mature and/or stable resource.

- Owing to the volume of material being handled, even a simple change implies a tremendous amount of work. The profession learned this lesson, for example, with the implementation of Anglo American Cataloging Rules 2 (AACR 2). Libraries are not, generally speaking, places where great risks can be taken.

- The fast-paced change that occurs as technologies mature always suggests that things will be cheaper and better tomorrow, and so we wait.

How can we experiment productively and create change that will both enfranchise new users and enhance information usability for all users? Foremost will be the need to develop new information structures -- for example, the ability to approach information from an individualized perspective and be drawn toward the desired information in natural steps and ordinary language. Machine responses such as "Error X394473" or "Unrecognizable Command" will have to disappear, as will limits on the paths along which we may approach even the traditional access points, such as author and title. OCLC-like algorithms are not usable.

The well-established distinction between physical and intellectual access to information becomes even more important as technology transforms information structures. Despite the value of browsing the shelves, where one may serendipitously discover useful material, the information package we know as a book is not well suited to random pulling from the shelves. A book itself, once selected, has reasonably designed aids to browsing. However, new levels of access are needed to guide users directly into books.

Online tables of contents, back-of-the-book indexes that call up the relevant text, and chapter and section indexing, while only replicating the essential elements of the traditional book, certainly form a starting point for the design of new access techniques.[3] For example, the progression of chapters in a book, or the organization of papers in a conference volume, provides information apart from content. When designing access systems, can we distinguish a section on a topic from an entire chapter on the topic? Can we focus on the co-occurrence of terms that have not been used as index terms but may represent an emergent concept?

We must experiment more rigorously with machine indexing, interactive authority control, expanded cross-referencing systems, controlled vocabularies, and semantic networks. Semantic networks, in particular, offer potential for viewing concepts in new and unanticipated ways, unlocked from rigid subject control. Research is needed to expand the effectiveness of knowledge represenation, particularly in defining relationships between terms.

Our old familiar "see also" problem haunts us in new applications, such as semantic networks, as much as it has plagued the syndetic structures of manual card files. Can we determine a set of relationships between terms that can be applied to controlled vocabularies to reliably extend the usefulness of those vocabularies? Establishing such relationships is a first and important step in enhancing the user's ability to make inferences based on the information on the screen rather than going to the shelves. The world of artificial intelligence is currently locked into "is a" relationships (e.g., "a dog is a mammal") and is thus greatly limited in its ability to emulate the subtleties of the English language necessary for meaningful machine-based reasoning. This is an area where the two disciplines, information science and artificial intelligence, have a great deal in common and can benefit from cooperation.

Controlling Access in Subtle Ways

Libraries have fought many noble battles over censorship (both inclusion and exclusion) while recognizing that their collections are unavoidably biased by physical and fiscal limitations. As we begin to erase the line between what a particular library owns and what it has access to, we can better defend ourselves in these battles. However, in this age of technology, new concerns arise over censorship that are tied directly to questions of access.

What is included in a database limits access. If certain aspects of a journal, such as letters or brief communications, are not picked up in the indexing of that journal, our access to and awareness of them is censored. Users make certain assumptions, while producers make certain disclaimers. Inadvertently or not, material is omitted that users assume is included. It is important, therefore, for library professionals to investigate the standards and criteria used by producers in determining inclusion and exclusion. The closer the information is to "scholarly communication," the more there is at stake in the academic environment. Criteria of inclusion and exclusion deserve special attention from the perspective of freedom of information as well as to achieve a fit within the academic environment.

A related concern in this context is whether to preserve or to replace the traditional practice of refereeing articles as a gate-keeping device in the scholarly community. Although I am neither predicting nor encouraging the demise of the book, online information is creating new delivery patterns for access to material, with speed of delivery to the marketplace and short shelf life as key factors. Journals appear well suited to electronic distribution. Standards are already in place for transmitting, editing, and reviewing journal articles.[4] For editors and authors, however, a shift to unrefereed, electronically transmitted articles raises questions about the traditional role of journal citations in the academic environment. The prestige of publishing in Journal A versus Journal B is very real. Just as we have unrefereed journals and vanity presses, we will undoubtedly see "author-published" papers filling some databases. This opens up an area of cooperative inquiry between publishers and scholarly communities.

The idea that access may be limited by indexing practices is more subtle. In addition to choice about the number of subject areas to be indexed, other choices -- such as the terms to be assigned, the depth of indexing (e.g., the general term "furniture" versus the more specific term "chairs"), and its consistency, both over time and among indexers -- are also involved. A considerable body of literature exists on these topics, yet findings are slow to be implemented.[5] Beyond research, funding is needed for potentially large-scale indexing applications that will afford a true test of viability and cost-effectiveness, as well as providing more effective dissemination of results.

Access is controlled not only by intellectual constraints and physical availability but by the sociopolitical environment. Probably the most obvious example is the practice by governments and private businesses of classifying and otherwise restricting access to certain information. Yet, even when information is public, restrictions exist. Certainly some control is necessary -- the need to preserve material necessitates restricting access to the physical object. Sometimes we are able to provide access through surrogates, such as microforms and photocopies, which allow the intellectual content to be freed from the fragile physical medium.

Additional research is needed to identify, from a user's perspective, those types of information that can be comfortably accommodated in new formats. We know, for example, that while microforms are necessary for storage, users turn to them only as a last resort.

We must also investigate, from the perspective of historians and archivists, how new formats, some already existing, can be effectively preserved and accessed when the technology moves on and renders them obsolete. We already recognize the difficulties of keeping microprint readers functioning. Who is worrying about the need to keep punched-tape and punched-card readers operational? Must we do that? We know there are other technologies with which to preserve content; however, just as reprinting a work of Shakespeare may preserve the basic content but yield something different from the original, what is lost from the original medium may, in itself, be important. We must develop criteria for determining what needs to be preserved, who will do it, and what techniques will be used to accomplish it.

Artificial Intelligence: A New Information Tool

I have already mentioned the need for standards, and the burden that sheer volume places on organizers of information to keep access systems both simple to use and cost-effective. Historically, access systems (classification by call number and subject heading strings) were kept simple for two reasons: the staff time and training necessary to execute the systems had to be affordable and cost-effective; and the more complex the system the less accessible it was for the casual user, so that costly intermediaries were required.

Today, one can create complex systems to assist catalogers and indexers in their work and provide sophisticated "behind-the-screen" support to patrons. In both cases the system appears simple to the user, whether cataloger or patron. The best example of this is the application of artificial intelligence to information handling problems.

Artificial intelligence involves a mixture of disciplines ranging from cognitive psychology to electrical engineering. It has had a roller-coaster existence since its development in the 1960s. Today this "science" is very much on the upswing and is capturing the interest of individuals faced with complex reasoning tasks. Some people consider it applied computer science; others feel it is a new discipline incorporating insights from many other disciplines.

Whatever definition one chooses, the main attribute of artificial intelligence is the ability to apply reasoning power and judgment to information. It seems to be the perfect tool for the information science community, and for libraries in particular. For example, the work of the reference librarian is to clarify through a process of iteration the information needs of an individual and then to suggest relevant sources. Analogous tasks are currently being handled by several expert systems, a principal application of artificial intelligence. The National Agricultural Library (NAL) and the National Archives have developed reference assistants in the form of expert systems.[6,7] Although the National Archives will not be making their system available to the public, new archivists are matching wits against it in their training. The program, developed within NAL to assist users in locating information in a highly restricted subject area, uses a commercially available software package. "ANSWERMAN," a highly functional basic system, has also been well received. A third system is in use at the National Library of Medicine (NLM).[8] There, an expert system may one day assist indexers in applying subject headings to medical literature.

Artificial intelligence tools are patently useful. Their primary drawback is the lack of subject fields adequately structured and described for use in an electronic system. Lacking this, system development costs are exceedingly high. Application-based research is critical to advancing our understanding of how to create systems efficiently, how to assess their usefulness, and how to measure their impact on our work environment.

A growing number of people have the technical skills required to encode knowledge into expert systems. What they lack is the ability to extract knowledge from experts and structure it in ways meaningful to retrieval systems. Knowledge engineers must embody a combination of specific library and programing skills. On the whole, computer-oriented people pay scant attention to the information management aspect of the problem, except to admit openly that they need to understand much more than they do about the structure and nature of information. Thus, expert systems represent one of the most obvious areas for joint research work.

Stagnation or Survival: Opening Up to Users

Librarians are often accused -- with some truth -- of organizing their collections for themselves, rather than for the convenience of their patrons. Because large library collections are not the domain of any particular user, they must be organized for access by all. The constant element in their use is the intermediary -- namely, the librarian. As a result, we find collections organized for those who help, not those who are to be helped. Whether libraries can move away from that paradox is mostly a matter of will and is more appropriately dealt with in other sections of this book. I have chosen to focus on the facts that libraries will be judged by how well they facilitate access, and that technology offers them a great opportunity.

Accommodating new technologies involves questions of organizational restructuring and the creation of new modes of operation where some responsibilities for information dissemination may be shared with computing centers or media centers. This prospect meets with a mixed reception: we are beginning to see discussions of "Chief Information Officers" in the business literature, but only laments in the library literature. In the academic environment, those involved with computing have shot up the ranks with alarming speed to positions at the vice-presidential level. (EDUCOM, a highly regarded organization of academic computing professionals, has taken note of this trend, and it was a session topic at their 1986 conference.) In my view, when the information technologies mature into stable, reliable, and friendly tools, the concern of administrators can move from how they can be controlled to how they can be more effectively used. More precisely, emphasis can shift from the carrier to the content. The point, however, is not to wait for the pendulum to swing. A serious analysis of the need for, and possible responsibilities of, cross-disciplinary "information czars" should be undertaken with a view toward change. Only rudimentary work has been done to date, with no consideration of the implications on library training in particular.[9]

In addition, considerable work remains to be done in exploring the overlap of the library with other service centers. For example, a well-honed skill for organizing information can be applied in the library, the county clerk's office, or the office of the college registrar. Have we isolated ourselves on the basis of certain physical characteristics of the information containers and thereby limited our professional horizons? For example, in an academic environment, information is primarily of three types: catalog-based (relatively static and well structured, including the card catalog and the undergraduate and graduate course catalogs); directory-based (changing regularly, with brief entries such as names, addresses, and service center hours); and calendar-based (fast-changing and dynamic short-lived information on events, department schedules, and local conditions affecting the organization's operation). Are these valid divisions? Are they useful in re-thinking the nature and role of libraries as information handling centers? A rich area of inquiry is to focus on the use of library concepts and skills in information management and access in other contexts.

Users have needs that are, despite protestations, quite similar. They want to find information relevant to a particular inquiry and to retrieve and use it to solve a problem or create new information. Differences exist mainly in how individuals perceive the world -- what terminology they use in describing a problem, how they structure the problem and identify its parts, and the sophistication of the information required to satisfy their queries. These differences can make or break an information search. For example, in some online catalogs one can search only by title, author, or full and precise Library of Congress Subject Headings. This is, of course, absolutely parallel with a card catalog drawer. An individual user whose terminology does not naturally fall into inverted strings and hyphenated subdivisions will have, and always has had, difficulty with such a system. Before lapsing into a discussion of the need for cross-references in automated catalogs, I will sidestep the issue and suggest that cross-referencing is not enough. Users require and deserve systems with rich and varied access vocabulary that will lead them into the standardized controlled vocabulary of a discipline. Research is needed to devise indexing systems better attuned to the online environment, where the restrictions of alphabetic order and single-entry listings no longer apply.

How can systems assist users in focusing their idiosyncratic views into agreed-upon terminology, and how can systems learn from the rich variety of approaches they encounter in user queries? The architect who designs, the cabinetmaker who builds, and the dealer who sells the innovative three-legged chair are all focusing on the same object but from distinctly different viewpoints. The problem of capturing multiple viewpoints in a single system offers rich ground for research and most probably will involve artificial intelligence in the solution.

Users also need systems that incorporate full texts, with the ability to move into a text when they have found something of interest. Yet systems that force one to forage through masses of full text with no hope of seeing the broad picture are hopeless. The centuries-old arrangement in printed literature of book, chapter, section, etc., retains value even in the electronic environment. In connection with indexes, such conventions offer a logical way to move through information to the portions that are of interest and potential use. How these traditional structures can be preserved, and what new ones should be created, are basic questions requiring research.

Early in the development of online systems, many library professionals felt strongly that users were incapable of stating their requirements. That was meant not as an insult but as a recognition that users had inadequate exposure to, and experience with, automated information retrieval. Users are far more sophisticated today, as is our understanding of their needs. On the other hand, as we move into closer alliance with scholars whose academic life is increasingly tied up with "scholar work stations" and "scholarly information systems," it may be time to reexamine the needs of users, not just in the academic environment but across the board. I am suggesting that, given the speed and capacity of current hardware and the power and increasing usability of software, we are in a position, with the assistance of users and technicians, to design multifaceted, multioption interfaces to knowledgebases. Studies such as those done on the use of OPACs (online public access catalogs) examine indirectly what users need and want in retrieval systems.[10]

It is time for a large-scale review of access to databases, not tied to existing systems but looking for commonality among the idiosyncratic approaches that individuals take in accessing information. Surely such work is critical to the design of new systems. A more radical, and more interesting, approach has been suggested by Michael Buckland.[11] Catalogs should be abandoned altogether! If that is not possible, they should be restructured as massive subject bibliographies. Buckland also recommends that whatever the access tool to the collection, it should be seen and should operate only as a first step in the continuum leading users into the material itself. Research should be pursued on redefining and redesigning the traditional tools of access to collections.

Technology and the Information Gap

For all its promise, there is little to indicate that technology is helping to close the information gap. In the information age, poor access to information reinforces the handicaps of those who are discriminatorily relegated to the margins of society. Complicated by end-user charges of various sorts, and formats that are useless without sophisticated equipment, parity in information is now more difficult for the "have-nots" to achieve than ever before.

For the older generation, there is the fear and unfamiliarity that cloaks machines, their keyboards, and the fast-moving words on their awkwardly positioned screens. Economically and psychologically, technology as it is found in most libraries limits access. For the young, on the other hand, technology is a turn-on. As the sophistication of the young grows, our information systems will be more harshly judged. We run the risk of alienating the young on two counts -- our systems may be seen as simplistic and not responsive, while the collections they reveal may be deemed to lack relevance or interest. To avoid a no-win situation, libraries must put in place plans for the review and upgrade of their information systems. Standards must be developed to assist those judging the adequacy of information systems -- meaningful quantitative measures that can be applied regardless of vendor and model.

Unfortunately, once a system is running smoothly and users are comfortable with it, it is probably due for replacement! As to the relevance of collections -- the demands of the young change as quickly as their shoe sizes. The problem is exacerbated, moreover, by the high-tech media and an intensified need for stimulation. How traditional libraries have managed to date is better left to other chapters of this book. Needless to say, a great challenge remains.

The issue of information disparity is an important one for a democracy, as it is for any society concerned with opportunity as well as equity. One role for libraries in the late 20th century, which is only a continuation of their historic role, may be as the great leveler -- to provide the knowledge and hardware to serve those who cannot buy into the new information age. The "information poor" may require a nationally mandated and agreed upon statement of information rights. The Freedom of Information Act is important, but like the copyright law, as technology advances, it will become less effective. As we develop an information policy (and economics will force us to develop one) we must, at the same time, look at the question of citizen rights and methods of information access. A floppy disk is of no use without a microcomputer.

The problem of pricing, which is addressed below, also has an impact on the information gap. A pricing policy for some information products and services, one that is both rational and relatively sound for the general population, only exacerbates the problem for the informationally and economically disadvantaged. We must learn how to operate a system for the majority without excluding those with needs but no means to pay.

Will information ever be viewed as so basic a necessity as to be subsidized with "information stamps"? It is, perhaps, an unappealing analogy and one that is a long way off -- or at least at a distance inverse to our concern for the information needs of all citizens.

Technology: The Answer as Problem and the Problem as Answer

I have already referred several times to the dual positive-negative role of technology in the area of information handling. This dichotomy will continue until the technology reaches a more stable level of development and maturity. What is to be done in the meantime? It is clear that important events are taking place in the world of information technology, for the most part independently of its largest user. With networking, for example, the events are easy to trace. Development is occurring along two different tracks. On one are the efforts of the National Science Foundation (NSF) to put in place massive networks primarily serving scientists who need access to very expensive and highly sophisticated computing equipment -- supercomputers in particular. Along the way, and not altogether as a byproduct, NSF wishes to facilitate communication among scholars in general, usually in the form of electronic mail. Moving along the other track are the efforts of the information community, which is attempting to link the major bibliographic utilities across the country. This effort is called the Linked Systems Project (LSP). The tracks are not parallel, the engines running on them are of vastly different sizes, and the engineers do not talk to one another. Furthermore, the two trains are headed for different stations.

The two mainstream efforts underway to create networks -- NSF and LSP -- run budgets that differ by millions annually; neither talks to the other in a literal sense; and functionally they are incompatible. How can this be? From NSF's perspective, the library community is "just another user with no unique requirements," so that whatever is designed for the scientist will be usable by the library community. From LSP's perspective, NSF is using old technology that many government agencies, among others, are no longer allowed to use and that is considered to have only limited potential.[12] While NSF agrees that the standard being used by LSP will become the norm and that the two will converge, NSF is devoting little of its considerable resources toward that end.

Since the early days of automation, libraries have purchased services that include the element called "telecommunications." Most of us remember it as one of the larger items on the monthly bill. We understood it to be the means by which the terminals in our cataloging departments were connected to computers in Ohio or California. What we failed to recognize, and it is almost too late to learn, is that telecommunications constitutes one of the most important parts of the automation package. I say it is almost too late to learn because of the incredible complexity of the science and engineering that surround telecommunications. We were not raised in that environment; we bought into it somewhat unawares. Those few among us who can truly understand both worlds and represent our needs in the telecommunications "space" (a favorite word of those in the business) must be heard, and quickly.

In the applications world, those running statewide and regional networks are beginning to realize that the wires are running empty. There is generally far more capacity on the existing networks than is being used. The information community, in which the library is a major player, is potentially the major user of networking. We must be careful when buying in that we do not sell out. We must have a strong voice in the standards arena, or services will be developed that are of no use to us. Given the fact that both OCLC and RLG are in the process of redesigning their telecommunications systems, now is the time to act. Education, perhaps more than research, is needed on both sides. Telecommunications people do not understand the stringent performance requirements necessary in a network intended to serve the library community. Information specialists must understand better what is happening in the telecommunications environment so as to become partners in the process, not just consumers.

Colin Cherry said, "Technology, per se, has no power."[13] It does, however, create power through the ability to control. Libraries, bastions of democracy that they have been, are playing in a different arena from even a few decades ago. We have seen in both the public and academic library worlds a competition for funds and a need to justify services and collections beyond an inflation-frayed norm. We cannot waste money on competition and incompatible systems: ways must be found to cooperate.

In an era of fast-paced technological change, information professionals are hard-pressed to deal effectively with many of the technological options they encounter. Administrators struggle with technical details or are forced to rely on the advice of staff who themselves are struggling to learn, or they hire technical "outsiders" whose performance is nearly impossible to judge and whose high salaries are an unfortunate reminder of other problems. Professional societies, in particular the Association of Research Libraries, have offered assistance in the form of seminars and working sessions. Such efforts amount to playing catch-up, or training "old dogs." (Professional education and training are topics of other chapters in this book.) For the long run, a more challenging professional curriculum must be designed to promote the interface on a basis of parity of library staff with other information specialists.

Technological Literacy

While arguing for a more technologically based professional education, one can also militantly insist that our current retrieval systems are too difficult and cumbersome and prove a barrier for many. They have been carried over, of course, from the precomputer age. When automobiles were first invented, an individual needed a specialized knowledge of how they worked. Repair shops were scarce; special protective clothing was required for the driver, as was a strong arm to crank the engine. Today's computers are at a similar point in their evolution. The user must know how to install boards, debug software, and interpret jargon in manuals and unintelligible messages that appear on screens. We can expect dramatic changes, such that the conveniences we take for granted when negotiating highways in our automobiles will be standard fare as we manipulate knowledge with our information machines. Research can enhance the role of the library community in ordering computer and software redesign, leading to a co-equal partnership with the technical community.

A portion of our user population has accepted the arcane nature of the information machine. As with the library clientele in general, however, they are a minute fraction of the potential audience. Current owners of microcomputers have learned to deal with the frustrations imposed by unfriendly, inconsistent, and primitive software, as well as incompatible, expensive, and ever-changing hardware. We as consumers have been excessively tolerant of these problems. Initially, we were in awe of computing and delighted at the potential it held for assisting us in our work. It has, however, remained a promise for too long. We understand our needs and we must express them clearly, not making do with unsatisfactory products or support. With few exceptions (most notably the Macintosh^{TM}), the designers of information machines have paid less than adequate attention to the use of their equipment. A stronger case can be made for cooperative work in the software area, where designers misinterpret or misunderstand the use of their programs. The results are sadly comical: the most commonly used features are difficult, while the complex, rarely used ones are a keystroke away! Some libraries have served as Beta test sites for new software -- the practice should be encouraged for all concerned.

Economics: The Driving Force

The information glut was born with the printing press. In the excitement created by the heightened availability of information, the fear of being inundated was not only inappropriate but difficult to imagine. For centuries the major difficulty was discovering the full extent of the resources that might be brought to bear on a question and then delivering the material. In the face of these problems, the average user was most often reasonably well served.

Information has always been unevenly distributed and more accessible to those who could pay for it. Amassing a private library was more than a genteel pastime; it was a means for education and a necessary adjunct for many professions. Public libraries attempted to offset the influence of money by providing materials freely accessible to all. Freely accessible, but not necessarily free. Rental books were commonplace in the last century, and today the profession still argues over "free or fee." Analogies with other services can be examined in the economic context of information. Simple arguments point to the "free" (no cost) availability of Sociological Abstracts in print form on the shelves as justifying a fee for those wanting to save time with the use of the online version. While such a posture may have made sense when print and nonprint were ostensibly the same product (one derived, in fact, from the other), a more serious examination is required now that some online products do not have print counterparts. The issue is not parallel availability, however, but cost. If libraries were funded to provide adequate access to the new forms of information, the fee/free arguments would never have surfaced, and we would continue to think of libraries as "free." Research on new economic models is critical if libraries are to assume a more active role in the information marketplace.

The economics are dictated by the rapidly changing technological environment. When information producers take risks to experiment with new products, someone pays or the company ceases to exist. We have seen, and will continue to see, producers struggling to provide essentially the same information in several formats. The popular combination of today is print, CD-ROM, and online database.

Again, an issue less of research than education is the matter of information producers working with libraries and other information providers to better understand the marketplace -- specifically, the needs of users. The buyer-seller relationship here is often one of mutual suspicion. Libraries feel that they are viewed as a captive audience with few, if any, alternatives for obtaining information. Publishers, on the other hand, fail to understand either the dynamics of libraries or the way information is used. The impetus for bibliographic databases came not from publishers trying to make a profit but from entrepreneurs who recognized the value of machine-readable production tapes as a new service area. Even today, as research projects such as the EIDOS program at OCLC are trying to address meaningful full-text retrieval, publishing executives and marketing types are so separated from their production process as to be incapable of decisions regarding the availability and format of segments of their product lines.[14] There are three lines of inquiry to follow here.

First, academic computing centers and their library counterparts are becoming increasingly indistinguishable, with lines of responsibility blurring slowly. The same trend can be projected for the once-clear division between information production and its provision to users. Just as the buzzword in computing is "end user," the ability of producers to broker to end users is evolving. How useful it would be if the various parties could assemble to understand better the challenges each faces and those to be faced together. The need is particularly great in the area of transmitting data in a uniform and standardized way. Except for the development of electronic standards for manuscript transmission, most work on NISO (National

Information Standards Organization) standards has been done at the provider, rather than the producer, end of the spectrum. As an example, the new Z39.50 standard for query protocol was developed primarily by RLG, LC, and OCLC.

Work is needed to devise better channels of communication between the information technology community and the information providers. There is a dangerous lack of awareness among both groups regarding research and development work being done by the other. A new journal or newsletter is not the answer. Can the technology itself be used to address the problem?

Along a second track, a broader area of work revolves around the question of how the library community can move from being a captive consumer into a position of influence, if not control, in the process of production and organization of information. Librarians need to understand more fully how to provide an economic stimulus to the production process.

By what means can the needs of users be focused and directed to producers? We have all had random "wouldn't it be nice if . . ." conversations with publishers. Can our professional societies play an influential role? Might some already do so, perhaps in totally different disciplines?

A third productive track of inquiry relates to potential changes in pricing strategies. To date, libraries have paid for making information available. A book, for example, is purchased, cataloged, and put on a shelf. Despite our best judgment regarding which books to purchase, some are never used. We pay for accessibility, not use. With the disassembly or disaggregation of books and journals into more discrete and finite information units, we can begin to rethink the issue of acquisition versus access, a call I issued in 1984.[15] There are at least two concerns here. First, as already discussed, can information be effectively structured to provide access to chapters, charts, or paragraphs regardless of the larger body to which they belong? Second, can we devise a pricing policy, tied all the way back to the author, that is both adequate to encourage the production of high-quality information and low enough not to deter users?[16] Enormous issues arise here, including questions of ownership, copyright, fair use, and quality control (refereeing), along with ease of access. Unfortunately, studies focusing on the economics of information from creation to use are virtually nonexistent in the library literature.

Research: The Poor Relation

It is instructive to note that the development of the MARC standards was field-initiated. The need for the Library of Congress to distribute its cataloging more efficiently prompted a massive effort directed at consensus in an area with no precedent. The most closely related activity may have been the standardization of programming languages, an effort that continues to be fractured by many versions of a single language. The translation and subsequent enhancement of paper-based standards into machine-readable conventions, like much of the work done in the library field, cannot be called research in the true sense of the word. Rather than investigation with the pure objective of advancing knowledge, librarians and library educators engage in the development of applications and diffusion of the results. This is not to be maligned. It does, however, raise the question of the role of research. Perhaps the development of the MARC standards can be thought of as a model for work in the information field. It has four characteristics:

1. The need to solve a particular problem;
2. The initiative of a few individuals in taking a leadership role;
3. The participation of a range of experts, each contributing to the development of a solution; and
4. The long-term need to coordinate effectively the dissemination of results, and to foster interaction among users to improve the "product."

The basic research in our field is not, by and large, coming from the schools of library and information science. It is coming from practitioners who feel the frustration of inadequate methods and systems and who are attempting to carve out solutions. The development of the expert systems cited above also fits this mold. In this case, there is an interesting additional feature -- the three systems emanated from three national-level library institutions: the National Agricultural Library, the National Library of Medicine, and the National Archives. One can readily include the Library of Congress research on deacidification and video discs in support of the pattern.

A natural dilemma arises here. If people engaged in research are removed from the practitioner's world, they lose the incentives and the natural laboratory offered by practical application. Yet, too embedded in the practitioner's world, they lack the time, and often the encouragement and recognition, necessary for research. An interesting initial research question might be why the library profession has not followed the model of all other professions in developing a strong research component within its bounds. Theology, nursing, education, engineering, and business, as well as the "pure" sciences, constantly examine the fundamentals of their fields, develop new methodologies, and revise their textbooks with new knowledge. Just as the medical profession has teaching hospitals and research institutes, we need teaching libraries and a series of research and development centers.

Can large public and academic libraries incorporate a formal research component? Can this be integrated into the education process? Do we, perhaps, have our research substructure relatively in place and need only to examine how best to involve others and assure adequate funding? Herb White has observed that library schools generally teach what libraries are like today, while a few teach about what libraries might become.[17] In the field, some practitioners are always ahead of the norm and some "behind the times." We need, in general, a more research-oriented professional education. By the time the Masters degree is conferred, graduates should already have participated in advancing the field, so that employers would have another, perhaps better, measure of an applicant's potential. In a way, the lag in curriculum poses fewer problems. An employer can provide an environment for day-to-day learning about indexes, abstracts, the online catalog, and database searching -- some employers would say they retrain new graduates anyway. What the employer cannot compensate for is a failure to think in terms of innovation and experimentation. The real professional always looks beyond the techniques and systems he or she has mastered and attempts to improve and advance the profession, not just practice it.

The whole problem, then, of setting forth research issues begs the question of who will do the research: Who is prepared to conduct the work, and where can it not only be encouraged and fostered but also become the norm? A commitment to innovation testifies that a discipline is growing, seeking to learn and build. Can our discipline be alive today, with expectations for tomorrow, without a strong research effort? There is nothing wrong with using the work of others when it can be productively applied to a new field. Yet, to rely as much as we do on the work of outsiders is, at best, worrisome. Unless we are to bow to the label assigned by more than one critic -- that of being handmaidens to progress in other fields -- we must create our own centers of research activity. How this can be accomplished most effectively is a research issue in itself. While the issue transcends access, the questions raised here bring out strongly the problems of a new profession ill-equipped and hard put to hold its own against suppliers, users, and alternative purveyors of information in an age of rapid change. The issue is so fundamental as to be inescapable. A strong research effort is needed -- organized, funded, housed, and promoted for the purpose of bringing together individuals able to address the agenda set forth in this book.

Conclusion

To meet information access needs in the 1990s, research is needed on a range of issues. Some of those issues are summarized below:

- For traditional media, new levels of access must be designed to address information at the chapter, subsection, diagram, and illustration level. Knowing that a book is about the Presidency and Congress is not adequate. Users must be given the opportunity to choose materials with increased precision, without actually having the material in hand.

- For new media, information structures must be developed that relay a sense of the scope and/or the degree to which a topic is addressed. The appearance of a concept in a full-text database must be accompanied by the information that it is addressed in passing, is a major component, is tied closely to another concept, etc.

- Tools such as those provided by the field of artificial intelligence must be explored. Specifically, techniques must be developed to structure specialized subject knowledge effectively to accommodate machine processing. Methods must be devised for rapidly assembling expert systems geared to offer basic, even remedial, assistance to users in specific subject fields. Finally, a rigorous definition of relationships among terms will both benefit the controlled vocabularies needed for effective information retrieval and provide new structures for semantic networks, extending the usefulness of these artificial intelligence tools.

- Because individuals approach their information needs in idiosyncratic, individualized ways, new technologies, including artificial intelligence, must provide a means to design systems that can respond to users as individuals rather than as classes (such as "beginners" or "experts"). Can we build systems that both instruct users and learn from them? Both are possible, but neither is being used effectively, if at all, in the library community.

- The information machine -- a combination of hardware, software, telecommunications links, and artificial intelligence -- is being designed for us. It should be being designed at least with us, if not by us. Collaborative research on how best to meet user needs is a vital and rich area for work.

- Tied to all the above is the need to examine new ways to free the intellectual content of both traditional media and obsolete nontraditional media from their physical containers, be they books, magnetic tapes, or nonstandard video discs. How can we meaningfully preserve the information while releasing it from the cumbersome and antiquated technology holding it captive?

- In the area of standards, research is needed to determine criteria that should be followed regarding the inclusion and exclusion of information in national and other databases. In addition, we need to determine how systems currently in place (such as journal refereeing) can be preserved, or whether acceptable substitutes can be devised.

- A critical examination of the boundaries that libraries have created to define their domain can point to new and expanded areas of influence. Can the concept of "one-stop shopping" for information become more a reality and less a gimmick?

- The economics of information is a source of several research topics:

    - How can users' fees be structured to compensate creators of information more directly and fairly without deterring access and use?

    - How can pricing encourage efficient use of information, given the natural fluctuations in use, and at the same time reward those authors whose efforts prove of most value in the marketplace?

    - How can adequate support for large-scale research and applications testing be reasonably assured? Are there, for example, funding models in other disciplines that may prove useful?

- A closely related area of concern is how the library community and its professionals can move from being captive consumers into a position of influence, if not control, in the production, organization, and dissemination of information. Much of the experience and knowledge of librarians goes unused. Have we defined too narrowly not only our information boundaries, but our intellectual boundaries as well? Why do we view it as a loss when a librarian moves into another field? Why are we unable to capitalize on such changes to broaden our profession's range of influence?

- Finally, broad questions surround the nature, quantity, and quality of library and information research. We need to address such questions as how the field of information science advances, where research originates, how findings are disseminated, and where and how they are challenged. Is it possible to break down the barriers between library schools and libraries? Can some libraries become laboratories for research? Can large libraries of all types be encouraged to provide a research environment? What will happen if we do nothing?

The rapidly changing and still very immature information technologies are not panaceas. Yet, it is clear that there is ample scope for leadership in their development and implementation. The ability to access information with ever-increasing accuracy and precision at levels now impossible to achieve will mark the 1990s. It is interesting to speculate about the day when one may be able to buy information products in self-contained units -- hardware, software, and information together in one package, which in many cases may be disposable, much like today's newspaper. The path to such accomplishments is not technical: the road is coming to meet us at the intellectual design level. We are, however, not ready for even that challenge. First, we must put into place a recognized program of research to establish our credentials for leadership in the next decade.

Bibliography

1. McArthur, T. Worlds of Reference: Lexicography, Learning and Language from the Clay Tablet to the Computer. Cambridge: Cambridge University Press, 1986.

2. McCoy, R. W. "The Linked Systems Project: Progress, promise, realities," Library Journal 111(16) 1986, 33-39.

3. Cochrane, P. A. Redesign of Catalogs and Indexes for Improved Online Subject Access. Phoenix: Oryx Press, 1985.

4. Electronic Manuscript Project. Washington, D.C.: Association of American Publishers, EMP Documents 1, 2, 3, 1983-1985.

5. White, L. Minimizing Variables in Indexing. Tucson: Arizona State University, November 1973, NTIS-PB-237-989.

6. Waters, S. T. "Answerman: An expert system for retrieval of information from library reference books," Information Technology and Libraries 5(3) 1986, 204-212.

7. DeSalvo, D. A., and Liebowitz, J. "The application of an expert system for information retrieval at the National Archives," Telematics and Informatics 3(1) 1986, 25-38.

8. Humphrey, S. M., and Miller, N. E. "Knowledge-based indexing of medical literature: The Indexing Project," Journal of the American Society for Information Science 38(3) 1987, 184-196.

9. Woodsworth, A., Gapen, D. K., and Pollock, K. "Chief information officers on campus," EDUCOM Bulletin 22(2) 1987, 2-4.

10. Hildreth, C. R. Online Public Access Catalogs: The User Interface. Dublin, Ohio: OCLC, 1982.

11. Jul, E. "The vanishing library catalog: Access, bibliography, and technology," Research Libraries in OCLC: A Quarterly 21(Winter) 1987, 10.

12. Avram, H. D., and Wiggins, B. "The role of the linked systems project in cooperation and resource sharing among libraries," Libraries and Computing Centers: Issues of Mutual Concern May 1987, 2.

13. Cherry, C. in The Age of Access: Information Technology and Social Revolution, ed. W. Edmonson. London: Croom Helm, 1985.

14. Kilgour, F. G., Kiser, B., and Brown, G. "An electronic information delivery online system," in Eighth International Online Information Meeting. Oxford, New York: Learned Information, 1985.

15. Molholt, P. "On converging paths: The computing center and the library," Journal of Academic Librarianship 11(5) 1985, 284-288.

16. Hohenberg, P., and Molholt, P. "What price the information age?" in Fourth Symposium on Empirical Foundations of Information and Software Sciences. New York: Plenum, in press.

17. White, H. "Library education programs: Independence and mergers," Library Journal 112(10) 1987, 84-85.

Relevant Literature

18. Bates, M. "System meets user: Problems in matching subject search terms," Information Processing and Management 13 1977, 367-368.

19. Edmonson, W. The Age of Access: Information Technology and Social Revolution. London: Croom Helm, 1985.

20. Information and the Transformation of Society. Papers from the First Joint International Conference of the Institute of Information Scientists and the American Society for Information Science, St. Patrick's College, Dublin, Ireland. Amsterdam: North-Holland Publishing, 1982.

21. Kochen, M. Information for Action: From Knowledge to Wisdom. New York: Academic Press, 1975.

22. Leonard, L. E. "Inter-indexer Consistency Studies, 1954-1975: A Review of the Literature and Summary of Study Results. Occasional Paper No. 131, University of Illinois Graduate School of Library Science, Champaign, Illinois, 1977.

23. Liebaers, H., et al. New Information Technologies and Libraries." Dordrecht, Holland: D. Reidel Publishing, 1984.

24. Mandel, C. A. Multiple Thesauri in Online Library Bibliographic Systems. Washington, D.C.: Library of Congress, 1987.

25. Prabha, C., Bunge, J., and Rice, D. How Public Library Patrons Use Nonfiction Books. Dublin, Ohio: OCLC, Office of Research, 1987. OCLC OPR RR-87/1.

26. The Role of Libraries in the Growth of Knowledge. Proceedings of the Fortieth Conference of the Graduate Library School. Chicago: University of Chicago Press, 1979.

27. Sack, J. R. "Open systems for open minds: Building the library without walls," College and Research Libraries 47(6) 1986, 535-544.

28. Machlup, F., and Mansfield, U., eds. The Study of Information: Interdisciplinary Messages. New York: John Wiley & Sons, 1983.

29. Lee, S. H. Access to Scholarly Information: Issues and Strategies. Ann Arbor, Michigan: Pierian Press, 1985.

30. Svenonius, E., and Schmierer, H. F. "Current issues in the subject control of information," Library Quarterly 47(3) 1977, 326-346.

31. Watson, M. R., and Taylor, A. G., "Implications of current reference structures for authority work in online environments," Information Technology and Libraries, 4(March) 1987, 10-19.

Comments by Reviewers

The three reviewers who commented on this article addressed the issues of artificial intelligence, access control, and user needs. They suggested alternative approaches to the topic area, additional courses of investigation, and additional areas for research.

Artificial Intelligence

Molholt endorses the development of artificial intelligence (AI) as a means of improving access. While this could prove very helpful to the field, it could also go the way of machine translation, a field closely related to AI that was heavily funded 20 to 30 years ago. It was found to be useful only in extremely limited applications. Similar results could occur with AI, and as it has its own sources of funding, careful preliminary research into its direct usefulness for libraries could prevent overspending of limited library resources.

She also touches on relationships between terms as a way to extend the usefulness of a given vocabulary. More extensive research is needed to establish the value of the relationships between terms. J. Farradane is a good source for further reading.

Controlling Access

In her discussion on controlling access, Molholt mentions the use of unrefereed, electronically transmitted articles and their impact on the role that journal citations have traditionally played. At present, professional journals and their referees are reluctant to accept advanced research papers or conceptual papers, and library administrators do not always take notice of research. A good example of this is the repeated research finding that half the answers given by reference librarians are inaccurate or significantly incomplete. This is a major fault in a central professional activity, and it has been ignored for years. The desire for libraries, rather than library schools, to act as centers for research deserves closer examination. Nothing is preventing existing libraries from conducting research. Yet, outside of applied work on library automation, very few libraries engage in research because they choose not to allocate resources to it. They have different priorities, such as building collections and providing service. It would be intriguing to investigate the alternative of libraries run by library schools, or the idea that tuning the MLS curriculum at library schools could routinely involve students in advancing the field.

User Needs

Molholt mentions the difficulty of creating access systems that accommodate the idiosyncracy of user needs and individual uniqueness. The work of Nicholas Belkin et al. is suggested for further reading on this issue, as he is attempting to develop access systems that are responsive to individual needs. Also recommended is the work of Robert Taylor and his colleagues, who are identifying features of "information packages" which can be codified and are responsive to user "values."

Taylor and Belkin's work may also suggest that assumptions made about the idiosyncracy of user needs are based on outdated conceptions of the nature of information and human beings. Research must be undertaken to determine whether there is something coherent and consistent about the human experience which technology could capitalize on to provide more individualized access. The answers will have profound policy implications: What kind of research will be proposed as essential? What kind of systems will be invented? Will they help at all? Will they only make matters worse?

Additional Research Objectives

- Molholt mentions the role of the library educator in doing research. A cooperative posture on research would benefit the entire field, with library/information educators working with practitioners on research projects, as has been done by the Council on Library Research. There is also important research being done in library education programs (see the JELIS article on research productivity) and by doctoral students.

- Molholt raises several research questions in her concluding remarks. Research issues on access should include the consequences of conceptualizing and investigating human behavior in different ways for information science research, information system design, and ultimately access. Also, research that followed the proposed suggestions to their conclusions would help raise awareness of possibly conflicting goals.

- Investigations of other work in progress (such as "hypertext") is recommended.

SELECTING INFORMATION OF ENDURING VALUE FOR PRESERVATION: CONTENDING WITH THE HYDRA-HEADED MONSTER

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Abstract

The rate at which information is created is increasing exponentially. Today, more information is being lost than was created and used by entire generations in the past. As a result, not all information can be preserved, or even used effectively after its creation. Librarians and allied information professionals must decide not only how information should be preserved but also what should be saved. The library profession has focused mainly on physical preservation needs, without fully considering the need for criteria to guide the identification of information of enduring value. The theory and practice of information appraisal employed by archivists may be of use to librarians in meeting the preservation challenge.

Introduction

Despite its fundamental nature, the issue of selecting the information that is to be preserved by libraries remains comparatively underdeveloped, in terms of both theoretical constructs and practical analyses of selection criteria. Selection is not, of course, the only library preservation issue. Library preservation also consists of developing effective physical treatment and reformatting techniques, building cooperative networks to make data about preservation efforts available, educating librarians in preservation management, and acquiring increased support and resources for the better care of library materials. In all these areas, librarians have made tremendous strides, especially during the past decade. But these concerns always follow a determination of what should be preserved.

This essay, written by an archivist involved in research on the selection of records of enduring value and by a former university library preservation coordinator, attempts to form a research agenda for the library community that addresses this singular need. The essay is not intended to criticize or praise librarians and archivists, nor is it a comprehensive review of library preservation issues. Anyone familiar with recent literature on library preservation and archival appraisal will recognize a considerable and beneficial exchange of ideas and practices between these two professions. In regard to selection, however, librarians may not yet have considered archival selection models as sources for strategies appropriate to library materials.

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The Preservation Challenge

In fulfilling the role of the library as a provider of information to the public, professional libarians have always been challenged by the constantly shifting demand for information of changing nature and quantity.[1] An equally important challenge is created by the physical impermanence of all information. Today, more information is being lost than was created and used by entire generations in the past. As a result, the librarian is challenged to decide, first, which information must be saved and, second, how it should be preserved. This is not an easy responsibility, likened by Margaret Child[2] to a "hydra-headed monster," but it is one that the library profession (and all other information professions, for that matter) must accept and deal with effectively.

Librarians and archivists, as well as other information specialists, have become much more cognizant of the fragility of all information forms. This relatively new concern is a response to greater awareness of the seriousness of physical threats to information sources. Perils abound: inherent vices of construction; debilitating environmental conditions; and the throw-away mentality of modern culture. Numerous studies have added layer upon layer of evidence to create an unsettling picture of the magnitude of effort required to preserve information. Consider, for example, findings such as these:

- **Printed Books**: "Typically, one-fourth of the volumes in [the nation's research] libraries are described as brittle -- that is, the paper breaks after one or two double folds of a page corner. Further, up to 80 percent of the books in those collections are acid and, without preventive action, eventually all will become brittle."[3] The problem is growing because most book publishers still use acid paper. Great quantities of information housed in libraries are rapidly disappearing.

- **Archival Records**: "Most government records created during the past century cannot withstand the rigors of use and time without significant loss in image quality, physical strength, and chemical stability. At the present time no state archives [this is true for other types of archival repositories as well] approaches the goal of providing total preservation care for its permanently valuable records."[4] In surveying the condition of the country's archival records, the primary conclusion reached is that "the United States is in danger of losing its memory."[5]

- **Machine-Readable Information**: "The danger of losing historically valuable records is greatly increased by the changeover to electronic recordkeeping . . . . Records created on tapes or disks are erased or lost before anyone exercised judgment about their possible value . . . . Given the rapidity of technological change, even information recognized as valuable can be lost because the equipment and skills necessary to retrieve it become obsolete or unavailable."[6] "The turn to computerization in the last 30 years hastens the danger of societies being left with little or no material for the study of their own past."[7]

- **Other Historical Records and Artifacts:** "Historical agencies and museums . . . are in the vanguard of collecting and preserving our cultural heritage, yet the majority are doing so without the money, people, and technical know-how they need. Because they lack adequate resources, the physical remains of America's past -- documents and artifacts alike -- are in peril."[8]

The questions raised by such analyses are simple to ask but extremely difficult to answer. What information about the past and present will be left for future generations? How is information that should be preserved best identified? In what forms should this information be preserved? Is information technology friend or foe? Who will supply the resources for preservation? How can society be convinced of the preservation crisis? How will the traditional role of the library be affected if the deterioration of valuable information is not arrested and reversed?

While librarians and archivists have become attuned to the problems of loss of information, the society of which they are a part has become accustomed to thinking of the 1970s and 1980s as the "information" or "electronic" era, and to hearing positive predictions about what fast access to enormous quantities of information will mean for the quality of life. More recently, however, such optimistic forecasts about the electronic era have begun to be qualified. If it is true that we are losing more information than past generations created, it is also true that we can generate and manipulate more information than can be effectively used or managed. There is too much "unrefined, undigested information flowing in from every medium around us."[9] The use of computers, to name but one information storage medium, leads us to believe that all information is of equal value. In reality, however, data are often extraneous or ephemeral, and even if it were possible, comprehensive preservation would be undesirable. Librarians and their colleagues must chart a course for preservation selection between the Scylla of excessive loss and the Charybdis of extravagant retention of information.

Library Preservation Programs and Literature

Although there is evidence that some librarians worried about preservation as early as the late 19th century, the scale of the physical preservation needs of library collections (primarily books) was not fully recognized by the library profession until relatively recently.[10] The variety of actions emanating from this concern has changed rapidly over the past three decades. Modern library preservation started in the mid-1950s, marked by the founding of the Council on Library Resources. The 1960s brought new research studies on paper aging and conservation, development of physical treatment techniques, the first appointments of library conservators, and publication of a few pioneering manuals on library preservation. The 1970s accelerated what had been started, earning the label of the "decade of conservation awareness in librarianship."[11] Manuals proliferated, research on techniques increased, numerous preservation officer positions were created, cooperative efforts (such as regional conservation centers) were initiated, and interest in a national preservation plan was renewed through bodies such as the National Conservation Advisory Council.

The decade of the 1980s has seen a new awareness among librarians of the magnitude of the preservation problem and the threat of irreparable damage to the holdings of this country's libraries, archives, and other information repositories. This awareness has led to greater efforts to understand the specifics of the challenge in individual libraries and, on the other end of the scale, to mount a stronger national effort to find and carefully allocate resources to resolve the problem. During the 1980s there have been serious efforts, such as Yale University's scientific and statistically sophisticated collection survey, to study the condition of holdings in individual libraries in order "to determine the extent and nature of the deterioration of books."[12] The Yale study has spawned similar analyses, seeking to identify the variety and extent of preservation problems.[13] Attention has also been given to the costs of various preservation alternatives, such as the cost accounting done by the Cooperative Preservation Microfilming Project of the Research Libraries Group (RLG),[14] and to the development of viable cooperative preservation programs.[15]

The library preservation literature of only a decade ago was firmly based on the premise that all information should be preserved. The report by Warren J. Haas on a national preservation system, and subsequent efforts to structure such a system, established comprehensive preservation as a legitimate goal.[16] This idea has been hard to abandon at both the national and institutional levels. However, consistent conclusions regarding the pervasiveness of the preservation problem, and recognition of the immense resources required, have led to an increasing, if still fledgling, interest in the matter of selection. In the late 1980s, librarians seem to be acknowledging that not all information can be saved, and that decisions to preserve some items are also decisions to allow others to deteriorate. Criteria for selection must be developed and adhered to institutionally and nationally. Fortunately, this need has been recognized.

The plans that have been proposed for assessing library materials based on the value of their information content have been propelled by the growing emphasis on collection management -- "the systematic, efficient and economic stewardship of library resources."[17] The concept of collection management has provided a new strategy for the improvement of selection for acquisition, and archivists have been influenced by the collection management approach in developing their own selection schemes. Cooperative collecting projects for libraries exist at both local and national levels. Notable among these are efforts sponsored by the RLG. The Conspectus Program invites libraries to assume collecting responsibility for specific subject areas, and these commitments have influenced the design of the Cooperative Preservation Microfilming Project. RLG is sponsoring an intensive investigation into cooperative collecting in two subject areas, and carefully analyzing the extent to which these can be said to be documented in American collections.

While collection management theory has had a significant effect on selection for acquisition, its influence on selection for preservation is less apparent. This may be attributable in part to the way many institutional preservation programs operate. Selection for acquisition assumes that subject specialists design and control the acquisition strategy. In contrast, much preservation activity focuses on evaluating damaged materials already in the library's custody. The process is often item-specific and reactive. Many library preservation programs are "circulation-driven," responding to damage or deterioration detected after use. Faced with trucks of decaying volumes from diverse subject areas, the tendency is to concentrate on the selection of treatment or reformatting options; strategic analysis of information can seem an unaffordable luxury.

Librarians are aware of the need to gain control over the flood of damaged materials. To this end, some preservation selection criteria have been proposed. Some approaches are relatively simple, relying on evaluation of paper and binding condition, or documentation of use.[18] Others consider additional factors to guide selection. Dan Hazen has defined a set of criteria that include user demand, "historical precedent and tradition" (potential use), volume and cost of materials, alternatives to preservation (such as interlibrary lending), and the information needs of certain disciplines.[19] Lisa Williams has composed a similar list, which includes monetary value, intellectual value, aesthetic or artifactual value, projected use, and usability or condition.[20]

The most elaborate and most recent selection model is the one advanced by Ross Atkinson. Atkinson developed a three-class structure. The first class represents items of "high economic value." The second class represents higher use items. The third class represents lower use materials, such as specialized subject collections, that need more careful evaluation. According to the author, decisions about the first two classes should be made by the local library, while judgments about the third class can be resolved only by extensive cooperative efforts to identify significant "subject collections in place," as the basis for effective preservation decisionmaking.[21] Although Atkinson's model is the most provocative of those suggested for selection guidance, it also reveals the embryonic nature of library selection criteria; Atkinson's model suggests comprehensive subject preservation through cooperation, an idea that has been questioned by at least one other librarian.[22]

The tendency in library preservation has been first to identify the physical preservation needs of various information media, then to address society's information needs and the information value of the materials in library collections. The process should be reversed. Concern for the physical needs of collections is commendable, but the threat of loss is only half the preservation challenge. Librarians, and all information professionals, must first make the hard choices about what information should be preserved, then seek the appropriate means and resources to accomplish the preservation.[23] The development and use of appropriate information selection criteria constitute a daunting task, and the resources remain insufficient. Here, however, librarians can make use of the ideas and practices of their archivist colleagues.

A Source of Help With the Selection Problem

Archivists have been concerned with selection of records of enduring value -- a process they term "appraisal" -- since the formation of an independent profession over half a century ago. They have long recognized that they cannot save all unique records, and, furthermore, that not all unique records are worthy of preservation. Archivists have also accepted that appraisal is their "first responsibility" --

requiring careful thought, then action -- which affects all else they do.[24] The records chosen for preservation determine all their other administrative functions and responsibilities.

Archivists have also agreed that the selection of records of enduring value is their most difficult work. As one prominent archivist recently wrote:

> "Appraisal is one of the archivist's most intellectually demanding and difficult tasks. Pressure to keep records comes from members of the research community who see value in almost everything. Pressure to destroy comes from the genuine and immediate constraints of limited space, limited resources to preserve, and limited staff to arrange and describe new accessions."[25]

Appraisal has been called "an inexact science, perhaps more an art"[26] and an "elusive, subjective process."[27] This formidable task has produced, not surprisingly, numerous debates,[28] but the disagreements have resulted in a dynamic and improving archival function in the 1980s, the subject of ever more sophisticated research, testing, and development.

Like library preservation literature and practice, archival appraisal theory and practice have gone through several distinct phases. Like their 19th century predecessors -- the state and local historical societies -- modern archival programs in their earliest years rapidly, and often randomly, collected everything and anything that seemed to possess historical relevance, emphasizing older materials. Much of great value was saved, along with questionable "historical" curiosities.[29] The establishment of the National Archives in 1934, and its difficult task of determining what to save out of massive and rapidly increasing quantities of records,[30] led to the first formally articulated appraisal criteria in the early 1940s.[31]

These basic principles were later codified by T. R. Schellenberg, the principal theoretician of the National Archives. Schellenberg noted that public records have two values: "primary values for the originating agency itself and secondary values for other agencies and private users." He then denoted two broad kinds of secondary values: the "evidence" that the records contain "of the organization and functioning of the Government body" that produced them, and the "information" that the records contain "on persons, corporate bodies, things, problems conditions, and the like, with which the Government body dealt."[32] Schellenberg's criteria have remained the basis for archival appraisal, even for nongovernment records, for nearly three decades, and they continue to play a prominent role in archival appraisal systems. Archivists have embellished his criteria, adding such elements as age, volume, form, institutional acquisition policies, and intrinsic value,[33] and techniques such as sampling.[34]

Over the past decade, however, archivists have become increasingly concerned about the validity and effectiveness of their selection criteria. This concern has come from a variety of directions and for a number of reasons:

1. Archivists became worried that the unilateral application of appraisal techniques by individual records programs was not necessarily adding up to an adequate documentary record of any aspect of the country's past or present.[35]

2. Archivists recognized that modern information technology and other changes in modern society, such as the remarkable interrelatedness of government and private records creators, limited the effectiveness of standard archival appraisal techniques.[36] Even a single event or function cannot be satisfactorily documented without examining the records of many records creators.

3. Archivists noted that the ideas of Schellenberg, widely followed and applied, were not necessarily applicable to nongovernment records creators and often did not take into sufficient account reasons other than legal mandates for records creation and continuing use.[37]

4. Archivists determined that many important actions were not being adequately documented in records traditionally saved as the primary sources of information of enduring value.[38] Archival theory assumed that the records of key decisionmakers or important administrative units fully documented the records creator; in fact, decisions, policy formulation, and actions are often determined by means that are not captured in the records of those key individuals and institutional units.

Although archival appraisal criteria have always emphasized informational or research value as a primary means of selection for preservation, two newly proposed archival appraisal models have reaffirmed the importance of this factor. Both models have been enriched by library collection management ideas.[39] A tripartite model for college and university records appraisal considers the value of information, the cost of retention, and the implications of appraisal recommendations. However, informational value is the first and most important criterion to be considered.[40]

The "documentation strategy" model is another framework that stresses information criteria before all else. This strategy is "a plan formulated to assure the documentation of an ongoing issue, activity, or geographic area." A team of records creators, administrators (including librarians), and users sees that the strategy, constantly refined, is "carried out through the mutual efforts of many institutions and individuals influencing both the creation of records and the archival retention of a portion of them."[41] This appraisal mechanism includes the notion, once widely regarded as heretical, that archivists should persuade records creators to create documentation where significant information gaps exist, along with a reemphasis on understanding the universe of information, before selecting what should be saved.

How can these trends in archival appraisal be of use to librarians, given the many legitimate differences between libraries and archives?[42] The two kinds of institutions have related, but distinctively different, collecting missions, which influence the nature of the materials in their care. Most library collections (books and periodicals) are not unique by nature. Additionally, while there is a pronounced trend toward cooperative collection development, libraries will probably always have a significant overlap of collections between repositories in order to serve local constituencies. The library's mission might be better compared with the combined functions of a records center and archives, because libraries have a mandate to make available information of temporary as well as long-term value. Yet within the library, the same resources must be used for physical maintenance of ephemeral materials and for information of enduring value.

These differences are not more significant than the similarities in the preservation challenge faced by both libraries and archives. Both are pressured by diverse constituencies to preserve; both are pressured by limited resources to destroy (or not to interrupt the process of deterioration). Libraries and archives share responsibility for materials of artifactual value, and for media chiefly valuable for their intellectual content. This similarity has prompted both professions to develop reformatting as a preservation technique, as well as to seek to preserve some materials in their original formats.[43]

Coping with the insurmountable problems of physical deterioration of information media and evaluating the content of extant collections has motivated librarians and archivists to experiment with new strategies for collection development and appraisal. Archivists are only beginning to explore the idea of a national plan for documentation, selection, and preservation, whereas the concept of a national preservation effort is already established among librarians. Librarians have not tested the potential of collection and preservation strategies based on the more ruthless (at least, that is the way many librarians might at first view them) collecting models of archival appraisal. This may be the time for libraries to adopt the "information value first" perspective that is currently enlightening archival appraisal and preservation theory and practice. If the difficulties of designing information selection strategies can be resolved, libraries will have one more tool for whittling the preservation problem down to size.

Research Agenda for Library Preservation Selection

In summary, the following research agenda is suggested as an overall approach to the problem of selecting information of enduring value for preservation in library collections:

1. **Reevaluate the concept of comprehensive collecting and preservation**. Libraries have accepted the reality that no single repository can build and maintain comprehensive collections in every discipline. Yet even the premise that shared collection development and preservation responsibility will make it possible to preserve all materials in designated subject areas may not be valid, for two reasons: First, resources for preservation may still be inadequate given the quantity and condition of information to be saved. Second, this approach may waste resources on information of little value. Comprehensiveness might be more profitably defined in terms of quality of information, rather than quantity of material.

2. **Test the potential of recent library and archival appraisal models for preservation selection**. Models suggested by Atkinson, and by archivists Hackman, Samuels, and Warnow-Blewett, should be investigated. Archival appraisal models suggest that preservation

selection follows information selection, and they provide various methods for systematic evaluation of information content.

3. **Refocus and redesign user studies to assess quality of use as a tool for preservation selection.** While there is disagreement over the weight that documented use should have in determining preservation priorities for research collections, there is little question that use is a significant consideration in determining the value of information. To date, user studies have tended to be descriptive, emphasizing quantity and frequency of use and research methods. Techniques are needed for more substantive analysis of use, to determine why certain sources are consulted and how information is interpreted and applied.[44] More qualitative analysis of use might enable libraries to publicize information sources in ways that would build increased support for preservation efforts.

4. **Evaluate local and institutional needs and work to reconcile them with national preservation efforts.** No matter how sympathetic library administrators are to a national preservation strategy, their sympathies often end up at odds with institutional priorities when the time comes to commit limited resources for preservation. For example, portions of collections that are nationally significant may be in low demand locally, as is frequently the case in academic libraries serving both undergraduates and more sophisticated researchers. Forced to choose between constituencies -- one highly visible and vocal, the other invisible -- many libraries will meet immediate needs at the expense of a long-range preservation strategy. The relationship between local and national preservation concerns is complex and fraught with thorny problems, which must be addressed if the best information resources are to be saved.

5. **Enhance automated systems to facilitate identification and analysis of information of enduring value.** Libraries have been leaders in developing bibliographic systems for access to information sources, including manuscripts and nontextual materials. Recent efforts, such as the RLG Conspectus Project,[45] should be evaluated[46] and continued, so that automated systems will be of more use in information selection strategies. The proposed addition of preservation information in the MARC format should also be an effective management tool. Other possible enhancements include minimizing the number of databases (automated and manual) to be consulted for preservation information, and concerted efforts to increase the number of repositories reporting their preservation decisions in automated systems.

6. **Initiate more interaction with other information specialists and other types of repositories for planning and problem solving.** The agenda for constructive interaction with other information professionals is almost limitless. More than token diplomacy, librarians and archivists must pool their intellectual resources to address the toughest components of the preservation challenge. For example, the question of whether technology will ensure the future of

traditional information formats, or cause the demise of recorded information, cannot be ignored.[47] Working together, libraries and archives could better assess and control the potential impact of technology on information creation and selection, reformatting options, and preservation management.

7. **Cooperate in statewide assessments of documentation needs and priorities.** State libraries, archives, and other repositories of unique resources should combine forces to survey the quality and condition of local information resources, and to determine the framework against which the value of information should be measured. This state-by-state analysis approach has already proven beneficial for historical records programs, by involving records creators and users and by gathering data useful for local and national preservation strategies.[48] A different geographic perspective on information resources would complement what is known about the subject strengths and condition of collections in individual libraries.

8. **Assess the impact to date of reformatting programs on use and access to information.** Libraries are investing increasing resources in reformatting irreplaceable, damaged materials with high information and low artifactual value. There is little question that this course is wise from a management perspective, but how do the users, who must ultimately support preservation programs, perceive this choice? Are reformatted items as frequently consulted as they are in their original formats? Are users following materials from the shelves to the film cabinets, or are they frequenting interlibrary loan offices to locate still usable hard copy? When is photocopying a wiser use of preservation resources than conversion to microform? Are libraries successfully affording the conversion to microform of materials traditionally used as hard copy? These and other questions should be answered to determine whether our best efforts to save valuable information are serving the audience for which the information is preserved. The economics of preservation selection must suit its goals.

9. **Integrate preservation selection with collection management education.** As described in this essay, collection management is the process of both acquiring and preserving information according to a defined strategy. Practically speaking, under the collection management umbrella, library professionals will tend to specialize in either preservation or acquisition, but this specialization should not undermine the essential interrelatedness of the functions of selecting and preserving information. Library training for collection managers and preservation and subject specialists should reflect this close relationship.

10. **Design interdisciplinary graduate and mid-career training programs in documentation and preservation selection.** Archivists have generally recognized that the best sources of education for them are programs that draw primarily upon library and information

science and history.[49] Graduate and continuing education programs should expose librarians to the best of archives and library theory in the analysis of information for selection and preservation.

Notes and Bibliography

1. Lancaster, F. W., Drasgow, L. S., and Marks, E. B. "The changing face of the library: A look at libraries and librarians in the year 2001," Collection Management 3(Spring) 1979, 55-77.

2. "Deciding what to save," Abbey Newsletter 6(August supplement) 1982, 1.

3. Committee on Preservation and Access. Brittle Books, 7-8. Washington, D.C.: Council on Library Resources, 1986.

4. Lowell, H. P. Preservation Needs in State Archives, 7. Albany, New York: National Association of Government Archives and Records Administrators, February 1986.

5. Committee on the Records of Government: Report, 9. Washington, D.C.: March 1985.

6. Ibid., 10.

7. Weinberg, G. L. "The end of history?" Perspectives 25(February) 1987, 17.

8. Phillips, C., and Hogan, P. A Culture at Risk: Who Cares for America's Heritage?, 82. Nashville, Tennessee: American Association for State and Local History, 1984.

9. Roszak, T. The Cult of Information: The Folklore of Computers and the True Art of Thinking, 162. New York: Pantheon Books, 1986. For examples of more optimistic assessments of the role of information in society, see Toffler, A. The Third Wave. New York: William Morrow and Co., 1980; and Naisbitt, J. Megatrends: Ten New Directions Transforming Our Lives. New York: Warner Books, 1984.

10. The best review of this subject is Darling, P. W., and Ogden, S. "From problems perceived to programs in practice: The preservation of library resources in the USA, 1956-1980," Library Resources and Technical Services 35(January/March) 1981, 9-29.

11. Lowell, H. P. "Sources of conservation information for the librarian," Collection Management 4(Fall) 1982, 1.

12. Walker, G., Greenfield, J., Fox, J., and Simonoff, J. S. "The Yale survey: A large-scale study of book deterioration in the Yale University library," College and Research Libraries 46(March) 1985, 112.

13. Bond, R., DeCarlo, M., Henes, E., and Snyder, E. "Preservation study at the Syracuse University libraries," College and Research Libraries 48(March)

1987, 132-147; Nainis, L., and Bedard, L. A. "Preservation book survey in an academic law library," Law Library Journal 78(Spring) 1986, 243-259.

14. McClung, P. A. "Costs associated with preservation microfilming: Results of the Research Libraries Group study," Library Resources and Technical Services 30(October/December) 1986, 363-374.

15. Gwinn, N. E. "The rise and fall and rise of cooperative projects," Library Resources and Technical Services 29(January/March) 1985, 80-86; and Child, M. S. "The future of cooperative preservation microfilming," ibid., 94-101.

16. Preparation of Detailed Specifications for a National System for the Preservation of Library Materials. Washington, D.C.: Association of Research Libraries, 1972.

17. Mosher, P. H. "Collection development to collection management: Toward stewardship of library resources," Collection Management 4(Winter) 1982, 45; Hazen, D. C. "Collection development, collection management, and preservation," Library Resources and Technical Services 26(January/March) 1982, 6-10.

18. Magrill, R. M., and Rinehart, C. "Selection for preservation: A case study," Library Resources and Technical Services 24(Winter) 1980, 45-57; Holland, M. E. "Material selection for library conservation," Library and Archival Security 6(Spring) 1984, 7-21; and Tomer, C. "Selecting library materials for preservation," ibid. 7(Spring) 1985, 1-6.

19. Hazen, D., op. cit., 7-10.

20. "Selecting rare books for physical conservation: Guidelines for decision making," College and Research Libraries 46(March) 1985, 153-159.

21. "Selection for preservation: A materialistic approach," Library Resources and Technical Services 30(October/December) 1986, 341-353.

22. Child, M. "Further thoughts on 'Selection for preservation: A materialistic approach,'" Library Resources and Technical Services 30(October/December) 1986, 354-362.

23. Although this essay refers primarily to selection studies about book preservation, the authors believe that the process is relevant for all library materials. Newspapers, for example, have been generally treated as items that require comprehensive preservation. The U.S. Newspaper Program has, however, shifted its focus to "selective" preservation that includes criteria of research importance, physical condition, intended audience, geographic scope, availability of nearly complete runs, and period of publication. See Field, J. "The U.S. Newspaper Program," Conservation Administration News 30(July) 1987, 5-24.

24. For the importance of appraisal to the archival profession, see Planning for the Archival Profession: A Report of the SAA Task Force on Goals and Priorities, 8-13. Chicago: Society of American Archivists, 1986.

25. Evans, M. J. "The visible hand: Creating a practical mechanism for cooperative appraisal," Midwestern Archivist 11(1) 1986, 9.

26. Rapport, L. "No grandfather clause: Reappraising accessioned records," American Archivist 44(Spring) 1981, 149.

27. Miller, F. "Use, appraisal, and research: A case study of social history," American Archivist 49(Fall) 1986, 372.

28. See for example, Rapport, L., op. cit., and Benedict, K. "Invitation to a bonfire: Reappraisal and deaccessioning of records as collection management tools in an archives -- A reply to Leonard Rapport," American Archivist 47(Winter) 1984, 43-49.

29. For a perceptive essay on this subject, see Shapiro, H. D. "Putting the past under glass: Preservation and the idea of history in the mid-nineteenth century," Prospects 10 1985, 243-278.

30. For an idea of the scale of the challenge facing these archivists, see Bradsher, J. G. "A brief history of the growth of federal government records, archives, and information 1789-1985," Government Publications Review 13(4) 1986, 491-505.

31. The pioneering essay was Brooks, P. C. "The selection of records for preservation," American Archivist 3(October) 1940, 221-234.

32. "The appraisal of modern public records," Bulletin of the National Archives, 8(October) 1956, 6.

33. Brichford, M. J. Archives and Manuscripts: Appraisal and Accessioning. Chicago: Society of American Archivists, 1977. For the idea of intrinsic value, also developing out of the National Archives, see Intrinsic Value in Archival Material, National Archives and Records Service Staff Information Paper, 21. Washington, D.C.: National Archives and Records Service, General Services Administration, 1982.

34. Kepley, D. R. "Sampling in archives: A review," American Archivist 47(Summer) 1984, 237-242.

35. Ham, F. G. "The archival edge," American Archivist 38(January) 1975, 5-13; and Hinding, A. "Toward documentation: New collecting strategies in the 1980s," in Options for the 80s: Proceedings of the Second National Conference of the Association of College and Research Libraries, ed. M. D. Kathman and V. F. Massman, 531-538. Greenwich, Connecticut: JAI Press, 1981.

36. Ham, F. G. "Archival choices: Managing the historical record in an age of abundance," American Archivist 47(Winter) 1984, 11-22; and "Archival strategies for the post-custodial era," ibid. 44(Summer) 1981, 207-216. See also Samuels, H. W. "Who controls the past?" ibid. 49(Spring) 1986, 109-124.

37. Boles, F., and Young, J. M. "Exploring the black box: The appraisal of university administrative records," American Archivist 48(Spring) 1985, 121-140;

Haas, J. K., Samuels, H. W., and Simmons, B. Appraising the Records of Modern Science and Technology: A Guide. Cambridge, Massachusetts: MIT Press, 1985; and "The MIT appraisal project and its broader implications," American Archivist 49(Summer) 1986, 310-314.

38. Klaassen, D. J. "Archiving balanced documentation: Social services from a consumer perspective," Midwestern Archivist 11(2) 1986, 111-124; and Yates, J. "Internal communication systems in American business structures: A framework to aid appraisal," American Archivist 48(Spring) 1985, 141-158.

39. Reed-Scott, J. "Collection management strategies for archivists," American Archivist 47(Winter) 1984, 23-29.

40. Boles, F., and Young, J.M. "Exploring the black box," op. cit.

41. Samuels, H. W. "Who controls the past," op. cit., 115.

42. For the full range of differences in the two professions, see Clark, R. L. Jr., ed., Archive-Library Relations. New York: R. R. Bowker, 1976; and McCrank, L. J., ed., Archives and Library Administration: Divergent Traditions and Common Concerns. New York: Haworth Press, 1986.

43. A decade ago, Pamela Darling sagely advised librarians that they "must learn to distinguish within [their] own collections between those things that are valuable as artifacts quite apart from the information they contain and those that are valuable chiefly -- or only -- for their intellectual contents." Likewise, archivists have developed the notion of intrinsic value to identify those items that require preservation in their original format in order to maintain all of their essential information. See Darling, P., "Our fragile inheritance: The challenge of preserving library materials," in The ALA Yearbook, xxxv. Chicago: American Library Association, 1978; and Peterson, T. H. "The National Archives and the archival theorist revisited, 1954-1984," American Archivist 49(Spring) 1986, 129.

44. See especially Conway, P. "Facts and frameworks: An approach to studying the users of archives," American Archivist 49(Fall) 1986, 393-407; and Dearstyne, B. W. "What is the use of archives? A challenge for the profession," ibid. 50(Winter) 1987, 76-87.

45. Gwinn, N. E., and Mosher, P. H. "Coordinating collection development: The RLG Conspectus," College and Research Libraries 44(March) 1983, 128-140.

46. Several archival institutions with statewide collecting mandates -- Minnesota, Wisconsin, and Michigan -- have done some analysis of their effectiveness in documenting a state. The New York State Archives is currently working with a group of archivists, librarians, historians, and others to plan for the effective documentation of Western New York. In each case simpler, more manageable groupings of topics have been used in preference to more complex library classification systems. See, for example, Thompson, G. "From profile to policy: A Minnesota Historical Society case study in collection development," Midwestern Archivist 8(2) 1983, 29-39.

47. For two extreme responses to this question, see Books In Our Future. Washington, D.C.: Joint Committee on the Library of Congress of the United States, 1984; and Neavill, G. B. "Electronic publishing, libraries, and the survival of information," Library Resources and Technical Services 28(January/March) 1984, 81.

48. For a summary of the statewide assessment reports funded by NHPRC, see Weber, L. B., ed., Documenting America: Assessing the Condition of National Historical Records in the States. Albany, New York: National Association of State Archives and Records Administrators, in cooperation with the National Historical Publications and Records Commission, 1983. For the context and importance of these reports, see Hackman, L. J. "A perspective on American archives," Public Historian 8(Summer) 1986, 10-28. One state has already begun the process of such broad cooperative analysis on the issue of preservation of information sources. Our Memory at Risk: Preserving New York's Unique Research Resources (Albany: New York Document Conservation Advisory Council, 1988) was an outgrowth of New York's historical records assessment report published in 1984.

49. See, for example, McCrank, L. J. "Prospects for integrating historical and information studies in archival education," American Archivist 42(October) 1979, 443-455; and "Conservation and collection management: Educational problems and opportunities," Journal of Education for Librarianship 22(Summer/Fall) 1981, 20-43.

Comments by Reviewers

The three reviewers who commented on this paper discussed the issues of preservation methodologies, costs, and technologies. They also suggested alternative approaches to the topic area and additional areas for research.

Preservation Methodologies

The authors mention the need to develop ways of judging the "quality of use." One way to do so is to study the research process and research methodologies. We cannot anticipate future research trends, but we can enhance our understanding of how research is done. How, when, and why do researchers use published, manuscript, visual, and artifactual evidence? Such knowledge can help all of us select more wisely, and make our selection in an integrated fashion.

Survey research to investigate the use, effectiveness, and impact of regional conservation centers, such as Northeast Document Conservation Center (NEDCC) and the Mid-Atlantic Preservation Service (MAPS) is necessary.

The authors maintain that libraries need to reverse the process by which they approach preservation. In some cases this is certainly true, but not in every instance. Research delineating which cases warrant which approach and the reasons for each would be beneficial.

Costs and Technologies

Research is needed to determine the effectiveness of emerging digital and optical storage technologies as viable preservation media: What is the expected life cycle for these media? What are the management and cost issues associated with these technologies, especially if their life cycle is relatively short?

More information on the development of comparative cost data for the various preservation media available is essential: What are the various unit production costs for each medium? What are the cost tradeoffs, savings, avoidances for one medium versus another?

Additional Areas of Research

- Work is also necessary to cite or pull together the range of preservation projects undertaken in the last decade. For example, the National Endowment for the Humanities has supported projects to test various approaches to library preservation. Two studies produced by the National Archives in 1986 should be considered: "Cost Comparison of Selected Alternatives for Preserving Historic Pension Files," by Ralph E. Schofer, and "Preservation of Historical Records," produced for the National Archives by the National Research Council.

- While the authors suggest some specific areas requiring investigation, research is needed that will focus on the broad range of research projects that should be undertaken -- by librarians, archivists, information professionals, and all fields to assure that the brittle materials in our research libraries will survive the century. Finally, whatever research is done should have as its premise an understanding of how libraries have been built up and the fundamental differences between the ways in which libraries and archives are used.

ORGANIZING, INDEXING, AND RETRIEVING INFORMATION

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Abstract

Technological developments have brought significant changes in the organization and retrieval of information, and recent research has begun to investigate the use of new technologies in libraries. A review of the literature shows that new capabilities as well as new problems are associated with online catalogs, online searching of bibliographic databases, indexing (whether manual or automated), full-text retrieval, and expert systems. Future research should focus on individual needs and at the same time adopt an integrated approach that is relevant to all online bibliographic systems, with indexing and retrieving viewed as interrelated processes. The widespread use of automated systems in libraries provides an excellent environment for research because it facilitates the observation and analysis of actual searching behavior of individuals, provides a large body of data, and presents an ideal setting for studying the applications of new technological developments.

Introduction

Technological developments are no longer limited to easing our life at work and at home; they are gradually introducing qualitative changes in libraries and information systems. Technology has become a central theme in library and information science, and many articles in its literature begin with the phrase "with the advent of computers."

The vision of a paperless society, where "traditional" libraries no longer exist and all information is electronically stored and manipulated, has motivated much recent research in librarianship. Two of the basic assumptions that guide this vision are:

- Computers can be programmed to organize information for retrieval; and
- With the help of computers, users will become more and more independent in searching for information.

In other words, this vision of the future implies that the role of librarians in organizing and retrieving information is diminishing and may eventually disappear.

The paperless society is, however, only a vision. At present, users still benefit from services provided by librarians, even though much of the information they now obtain has been processed electronically. Nevertheless, a growing number of administrators subscribe to the notion that the need for professional librarians to organize and retrieve information is diminishing. For example, some public and academic libraries assign computerized literature searching to technicians, and some special libraries have been asked to delegate searching to the users, or library patrons, themselves.

This paper reviews and summarizes the contribution of recent major works about the organization and retrieval of information. It examines the relevance of the findings to library decisionmaking, and focuses on whether research in librarianship has provided any evidence to substantiate the assumption that the processes involved in organizing and retrieving information no longer require the expertise of a professional librarian.

Definition of the Topic Area

The process of retrieving information typically consists of two stages: users first identify the information that will answer their information needs, and then they actually retrieve the relevant information. Reality, however, is much more complex than this description. More important, the concept of "information needs" is an elusive one: even if a real and precise need for information exists in an objective sense, it is difficult to define that need accurately. Asking users to define their information needs requires them to describe in exact terms what they do not know, a situation that is most often contradictory in nature.[1]

For the purpose of this paper, however, we assume that the information needs expressed by library patrons are clearly defined. We also assume that most of those needs are subject-related: that is, users want to find information about a certain subject. Further, users' requests include an additional facet: the purpose of the request. For example, a request for information about online catalogs by a library patron whose purpose is to learn how to use such catalogs is essentially different from the request that was made by the author of this paper, whose purpose was a literature review on the subject.

Thus, to identify information that will answer their needs, users express these needs in subject-related requests. Once they are set to retrieve the information they have already identified -- with the help of the library or any other source of information -- they look for known items.

Users can employ two types of retrieval tools for subject-related requests: the library catalog and abstracting and indexing (A&I) services. Traditionally, users have been expected to use card catalogs and printed volumes from A&I services on their own, with the librarian available on call. Today, a growing number of libraries provide access to their collections through online catalogs, and most A&I services can be accessed online via search systems such as ORBIT, DIALOG, and BRS.

The first search systems that provided access to A&I services (now called bibliographic databases) were geared to the professional librarian. Online catalogs, on the other hand, have always been designed for direct user searches.

These two types of retrieval tools, whether manual or computerized, organize information in a manner that is useful for retrieval; the construction of retrieval tools involves the creation of subject indexes. For printed tools, subject indexes include index terms -- descriptors or subject headings -- taken from an authority list of controlled vocabulary. A thesaurus is such a list of controlled vocabulary terms that are used both for searching and for indexing (assigning descriptors or subject headings to bibliographic items). In addition, indexing can be performed either by humans or by computers (automated indexing).

In addition to thesauri, computerized tools provide subject indexes that list all the meaningful words in the bibliographic citations and in their abstracts. Such indexes are generated by the computer and do not require manual indexing or the construction of a thesaurus; users search them with free-text terms. In recent years, databases have been created that provide the complete text of documents in machine-readable form. Such full-text documents as journal articles, textbooks, and encyclopedia chapters can be searched with both free-text terms and descriptors.

It is beyond the scope of this article to provide a comprehensive review of research projects in this area. Instead, research projects that set new trends or those that reflect new approaches are reported. In addition, to keep the bibliography manageable, most often only one citation is provided for a research project, the one that is most accessible to the public.

Retrieving Information

Online Catalogs

Online catalogs are designed for library patrons. Though libraries had prior experience with online retrieval through bibliographic databases, the introduction of online catalogs in the late 1970s and early 1980s marked the beginning of a new era in which users began to do their own searching. This new scenario has had an important effect on research in librarianship.

Unlike research in the searching of online bibliographic databases, studies of online catalogs have focused on user requirements. Major studies have been set up to discover users' attitudes to and acceptance of the new catalogs by examining characteristics of both users and catalogs. Most studies, however, have concentrated on the human-computer interface -- that is, on how easy it is to "converse" with the computer. Only a few have addressed the retrieval problem: whether users are satisfied with the results of their searches, and what could be done to improve the results.

Further, studies of online catalogs are guided by an administrative approach that is essentially different from the approach taken by researchers in the area of online searching in bibliographic databases. In studying online catalogs, researchers assume that the user population is a given, and that features of the catalogs themselves should be examined in order eventually to design an online catalog that is most useful. In contrast, recent research on retrieval from online databases assumes that the databases and the search systems are a given, focusing instead on the characteristics of users (i.e., professional searchers) that make for successful online searching.

Surely, the difference in research approaches stems from the reality of library decisionmaking. Librarians do not elect which patrons to serve, but they may want to design an online catalog and should be able to select the system that provides the best catalog for their users. In contrast, library administrators cannot change databases and search systems, but they can select among a number of candidates for the persons who will best perform online searches.

Nevertheless, the searching of bibliographic databases and of online catalogs is the same process: searching for bibliographic information. There is a diminishing distinction between the database as a store of citations to journal articles, which can be manipulated with sophisticated techniques, and the online catalog as a store of information about monographs, which provides only for simple manipulation. The difference in research approaches is, therefore, an impediment to both areas of research: studies of online catalogs cannot rely on research that already has been performed in online searching, and vice versa.

User Interface with Online Catalogs. Online catalogs are a relatively new phenomenon in libraries. In 1981-1983, the Council on Library Resources (CLR) funded a nationwide study of 17 online catalog systems (both in-house and commercial) in 29 libraries. While many articles about experience with online catalogs in specific libraries have been published (e.g., Walton et al.[2] and Kranich et al.[3]), this first large-scale study provides most of our knowledge about the online public access catalog (OPAC). The study was conducted by various agencies, and although attempts to summarize and synthesize its results have been made (e.g., Matthews and Lawrence[4]), further interpretation and integration of the vast amount of data are required before specific conclusions can be drawn.

Typical of a large-scale study (although a novelty in research about online searching behavior), the CLR study applied a variety of methods. A survey of 8,094 users and 3,981 non-users of online catalogs in 31 libraries collected data through a questionnaire administered by various agencies. A summary of the data collected is provided by Matthews and his colleagues.[5] They point, for example, to demographic characteristics of users, the manner in which most users are informed about the availability of an online catalog, the persons to whom they address their requests for help, problems with the interface, and the rate of success and satisfaçtion perceived by the users.

Focused-group interviews with library staff and patrons -- both users and non-users of online catalogs -- were carried out in six libraries,[6] and were conducted with a group through an open, in-depth discussion led by a moderator. While such interviews do not supply quantitative data, they can explore the degree of satisfaction and expectation of both patrons and staff. Among other things, these particular interviews revealed that while users of online catalogs are happy to use them, they have problems with subject access to information, and they expect online catalogs to provide more services than are currently available.

The results from the focused-group interviews were complemented by the results of individual and group interviews conducted among library staff at three research libraries.[7] These interviews supported the analysis of the questionnaires and addressed issues such as problems in using the catalogs, possible system improvements, and the impact of online catalogs on library staff and patrons.

In addition, transaction log analyses, in which the protocols of individual searches are analyzed, were performed in seven libraries.[8,9] It was found, for example, that while there was great variability in the length of searches and in their types (author/title or subject searches), users tended to remain in the type of search that was initiated and to repeat their mistakes. These analyses also provided statistics about issues such as the rate of success (non-zero hits) in subject and author searches, frequency of commands used (in particular, "sophisticated" commands), and patterns of searches.

Feature analysis of ten existing online catalog systems was also performed for the CLR study.[10] This was a functional analysis, documenting the functions and commands of each system, its interface capabilities, and the documentation available to users.

The CLR study stimulated further analyses of the data, additional explorations, and considerations of possible implications. For example, Cochrane and Markey showed how the results from focused-group interviews were useful in interpreting questionnaire findings.[11] Borgman, who compared the study results with research findings in other areas of online bibliographic retrieval, concluded that more similarity existed in conceptual than in mechanical problems.[12] Dickson, on the other hand, analyzed a sample of zero-hit author and title searches to discover reasons for failure and concluded that users have a conceptual model of the online catalog that is different from their concept of the card catalog.[13] Last, a collection of articles assessed the impact of online catalogs on technical services, reference services, subject access, and library administration.[14]

In summarizing the CLR study, Matthews and Lawrence[4] have outlined the principal findings:

- Experience with the library and its catalog is the most important factor in determining success and satisfaction in using the catalog.
- Online catalogs should provide a variety of interfaces, depending on the type of search and the level of user experience.
- User attitudes adapt to the capabilities and limitations of the online catalogs being used.
- The form and nature of training and user assistance are important.

These findings only substantiate common knowledge among librarians; they do not provide insight as to how online catalogs should be designed.

Subject Access Through Online Catalogs. The importance of subject access through online catalogs was the most significant finding of the CLR study.[4,15] This is not surprising, since early studies of catalog use (Lipetz[16] and Bates[17]) showed that subject access through card catalogs was inadequate. With online catalogs -- which are actually automated card catalogs -- the issue assumes even greater importance because library users who are not satisfied with subject searching in a card catalog expect to be more successful with online catalogs.[5] Here again, the CLR study only substantiated previous findings but did not provide guidelines for improved subject access.

Present online catalogs are more sophisticated than the early ones and stand ready to facilitate improved subject access. However, the various ways that users can actually be helped in subject searches are not yet known. A display of a classification scheme, for example, can help users to "browse" in a subject area.[18] It is not clear, however, which classification scheme is most suitable for this purpose: Dewey Decimal Classification[19] or Library of Congress Classification.[20] Each scheme raises both conceptual and technical problems.[21,22]

Another approach to aid users is to provide online help in the use of the Library of Congress Subject Headings. Such assistance could include an alphabetical display of the headings with cross-references, or a display of related subject headings. In addition, searching keywords in titles (i.e., free-text searching),[23] or even in indexes and tables of contents of books, can improve subject access.[15]

Research on online catalogs has only begun to consider subject access, and most of the literature in this area is limited to expert opinion about the direction online subject access should take.[24] With the development of more powerful online catalogs, subject searching becomes more similar to subject searching with bibliographic databases. (For example, CITE -- the online catalog at the National Library of Medicine (NLM) -- can also access the NLM databases.[25]) All in all, research in subject access to online bibliographic databases is more developed, and studies of online catalogs can draw on that research experience.

Online Searching of Bibliographic Databases

The first search systems for bibliographic databases were designed for professional searchers, mostly librarians. Research in online searching began in the 1970s with two large-scale studies that focused on user attitudes, satisfaction, and success.[26,27]

Most of the research that followed, however, concentrated on the attributes of a "good searcher": the personal characteristics a librarian should possess to become a successful online searcher. Experience in online searching,[28] type of training,[29] and personal traits such as creativity[30] and cognitive abilities[31] are among the characteristics examined. No conclusive results have been found, and most investigators have observed that the large individual variability among searchers impedes their studies.[32]

The method used in online searching studies is well established today. Briefly, an experiment is set up in which each subject is assigned to a group, depending on his or her score on the tested characteristics (e.g., experience, cognitive style). All subjects are asked to search a given set of requests, and their search processes and results are analyzed and compared. These analyses employ a well-established set of measurements. The search process is evaluated by the number of commands used, number of search terms entered, length of search, and similar measurements. Search results are evaluated by precision (what proportion of the citations retrieved are relevant), recall (what proportion of relevant citations have been retrieved), and unit cost (the cost of each citation).

Why have these studies failed to produce conclusive results? There are several possible reasons, but what immediately comes to mind is that the personal characteristics (the variables) that have been tested do not affect the quality of online searching. Unfortunately, such a generalization contradicts common sense: it is common knowledge among librarians that experienced searchers perform "better" than novices, and that training is important for online searching. Therefore, one conclusion is that the measurements which have been used are inadequate. This conclusion was substantiated when ten librarians with almost identical subject background, training, and experience scored very differently on search process measurements.[33]

Another impediment to obtaining conclusive results is the experimental setting, in which variables that are not studied are assumed to be controlled. In reality, however, a large number of variables affect online searching behavior,[34] and no single experiment can control for all of them. Variables ignored in these experiments, such as the ability of a subject to perform a search without interviewing the patron, may have more significant effects than the ones tested.

While identifying the characteristics of a good searcher may at times help administrators to decide which employees should perform online searching in their libraries, the issue is of very little significance. This is particularly so when both online catalogs and bibliographic databases are searched by library patrons themselves. The important issue is to discover the characteristics of a "good search." Identifying strategies and moves that can enhance the success of online searches is beneficial to users of all online retrieval systems.

The Search Process. Online searchers have long known the importance of the search process. Journals such as Online, Online Review, and Medical Library Reference Quarterly include many articles that describe useful strategies for certain databases and search systems.

Research in this area is sparse, however, and requires a different research method. Based on the experience of librarians, Bates has proposed a number of information search tactics that could be employed in online searches.[35] Tactics to be used early in the search include the examination of information already found in the search, and those to be used later in the search include the rejection of items indexed by certain terms.

Fidel analyzed search protocols and verbal protocols of seven experienced searchers performing approximately 90 searches as part of their regular workload.[36] As a result, she listed the moves (changes in search formulations) that searchers made to increase the size of the retrieval, to decrease it, or to improve it altogether.

Studying the search process is a complex task requiring the probing of phenomena that are not easy to observe or analyze. Nevertheless, user training and the design of useful online retrieval systems cannot be successful until this process is thoroughly understood.

Patron Searching. The idea that patrons can search bibliographic databases for their own requests is rapidly gaining popularity. Search systems and other commercial outfits are providing an increasing number of gateway (front-end, or intermediary) systems such as Search Helper or Knowledge Index that are supposed to mediate between the end user (the patron) and online bibliographic systems. Such gateway systems do indeed provide a simple interface with search systems that frees end users from having to learn a command language or deal with the idiosyncrasies of specific databases (this is especially important since most end users are not likely to perform online searches frequently). Most of the current gateway systems, however, achieve their simplicity by providing end users with a limited range of capabilities, thereby simplifying the search process itself.

While several in-house studies have been performed on gateway systems, studies of end users searching their requests directly would have far more impact. The only example of such a study is a research project that examined 11 years of searching the NLM databases by pathologists and pharmacists.[37] The results of this study are many, but as yet not all have been published. Of particular interest here are the findings that end users did not encounter many problems with the technique of searching but rather with the vocabulary and content of the system, and that most performed simple searches. In addition, the major problems encountered were with the more sophisticated capabilities of the databases, problems that sometimes caused a substantive loss of citations.

Although this study examined a specific population, its results substantiate the finds of online catalog use studies: the weakest point in patrons' searching their own requests is their inability to formulate successful strategies. Gateway systems do not provide help because they do not employ any of the sophisticated capabilities of databases -- in fact, some even eliminate simple ones. At present, the only source on which we can rely for search strategies is the community of experienced online searchers.

The Role of the Librarian

Online catalogs and gateway systems are likely to increase patron use of catalogs and bibliographic databases. Moreover, as indicated by the CLR study, patrons expect more from the new catalogs than from card catalogs. While we would like to think that online systems of the future will be friendly and helpful enough to be self-explanatory, much research and development is still needed before this ideal can materialize. Although current online systems provide increasingly friendly interfaces, patrons still harbor many misconceptions about the coverage of these systems and about successful search strategies.

For this reason, the role of the librarian in assisting patrons to perform their searches has increased: training patrons in the use of online systems is now a major responsibility for librarians. The significant issue is which method of patron training is most effective.

Having online bibliographic systems for public access in their libraries has forced librarians to train their patrons. The literature on user training for both patrons and librarians abounds with reports on experiences in individual libraries, their successes and problems. Most libraries have applied instructional methods that seemed useful to them: group and one-to-one instruction, handouts, help screens, workbooks, charts, and manuals.[38]

Some libraries have relied on examining patrons' searching behavior, either by analyzing transaction logs (e.g., Dickson[13]) or by the verbal protocol method, which consists of analyzing recorded accounts of patrons describing their work and thinking during problem solving (Sullivan and Seiden[39]).

While such reports are anecdotal, the conclusions that are shared by all studies should be seriously considered. A summary of this literature reveals two significant findings:

- Library instruction, reference assistance, and staff experience are of prime importance, because patrons need help in forming a correct mental model of the online catalog.
- There is a need for a variety of formal and informal methods of instruction, tailored to patrons' individual needs.[38]

Despite the findings that have emerged from the literature, as yet no evaluation study of user training has been performed.

Research Needs for the Future

Research needs for the future are greatly affected by the qualitative change in libraries and information systems that has been introduced by technological developments. Two major themes are apparent.

First, the widespread and ever-increasing use of automated systems for information retrieval enables researchers to investigate phenomena under actual, rather than experimental, conditions. The initial large-scale studies of online catalogs and bibliographic databases provided general and descriptive data about use, satisfaction, and problems. While important in pointing to research needs and in providing evidence that substantiates common knowledge among librarians, most of these data cannot be used directly in library decisionmaking or in system design. At present, however, librarians and library patrons are routinely searching online catalogs and bibliographic databases, and researchers can observe and analyze their searching behavior. Such analyses, which are based on actual searching, provide a deeper understanding of the search process because they can answer the "why" questions. They also facilitate investigations into individual variability in online searching, and they will produce findings that are relevant to library decisionmaking and to systems design.

Second, recent developments in libraries are removing the traditional barriers among specialties in librarianship. For instance, searches of online catalogs and bibliographic databases are essentially the same. In fact, in the future, libraries probably will provide access to both online catalogs and bibliographic databases through a single interface. Realizing this, one sees immediately that online catalog studies would be more useful if they examined the quality of retrieved sets rather than defining success as a non-zero hit; and that research on bibliographic databases should look at system features. Similarly, investigating subject access through online catalogs is no longer limited to the study of Library of Congress Subject Headings, but must consider other controlled vocabularies, indexing (manual and, possibly, automated), full-text retrieval, and expert systems.

Thus, the future calls for integrated, rather than fragmented, research. Studies should be designed to make their results relevant to the searching of both online catalogs and bibliographic databases. Moreover, with the descriptive data already collected, research in retrieval systems for subject access can now focus on its central issue, the search process. Examination of the search strategies that are available, and the conditions under which each of them should be used to achieve satisfactory retrieval, is necessary for the research to be relevant to library decisionmaking.

Human-Machine Interface. Ideally, human-computer interface should make human-computer communication as fluent as person-to-person conversation. Indeed, natural language interface, in which users converse freely with the machine, is a subject of much research in linguistics and computer science. Unlike automated bank teller machines, which are used to solve well-defined problems that are also narrow in scope, systems that provide subject access to bibliographic information are used to solve problems that are ill-defined and that range over a variety of subject matters. It seems that interfaces developed for solving simple problems are not likely to be adequate for library patrons, and that personal communication with computers in libraries is only a vision in the foreseeable future.

At present, there is some evidence that users have technical problems when communicating with the current automated systems in libraries,[12] but the nature of these problems is not clear as yet. Studies of users performing actual searches can identify the nature of these problems and guide systems designers in improving the human-computer interface. Such studies should examine problems in using commands and in understanding the computer's responses and displays.

Special attention should be given to factors that are important to the search process, such as experience or level of motivation. It is likely, for instance, that inexperienced users and experienced ones would encounter different problems, and consequently might require different sets of commands or computer displays.

Subject Access. Research on subject access through automated systems should cover two main themes: user aids and models of the search process. As described earlier, a variety of existing schemes (e.g., Dewey Decimal Classification) and arrangements (e.g., alphabetic display of the Library of Congress Subject Headings) can be made available to users to enhance subject searching. These aids should be tested with actual users, and their effectiveness and suitability for specific user needs and characteristics should be compared. Technical difficulties may preclude large-scale studies that employ all possible aids. Nevertheless, the combined results of studies examining a limited number of aids would be useful.

Most of the aids to subject access suggested in the literature are automated versions of aids that already exist in print form. Effort should be put into discovering new aids that might be applicable only in the online environment. One example is Bates' end-user thesaurus, which has a variety of special features, such as listing all terms in use in a catalog or database at any given time.[40]

Models of the search process are useful for a variety of purposes. When they are based on searching behavior of "successful" searchers, they represent successful strategies. Such "success" models can be used either as examples to be followed in user training or as a source of knowledge for intermediary expert systems. Both uses are likely to enhance subject access.

Models of tactics and moves used to improve search results as well as a model of the selection of search keys -- whether free-text terms or descriptors -- already exist.[35,36,41] They have been developed for bibliographic database searching, and their applicability to online catalogs should be tested. Further, other decision-making processes in the search process need to be described by such models: when to use automated tools and when printed tools are better; the selection of databases to search; and when to stop searching.

Patron Training. Theoretically, patron training can be performed either by computers or by librarians. Realistically, most patron training is performed by librarians. Although studies in individual libraries, as well as the CLR study, show that some training is needed, two basic questions require rigorous testing:

- When is training needed?
- Which methods are most effective for each user group?

These questions are not simple to answer, and straight comparative studies would not provide the necessary results. Additional exploratory research is needed before studies to answer these questions can be designed. For example, observation of users' searching behavior and an in-depth analysis of their thought processes (e.g., Janosky[42]) will point to problems that might be remedied with training. Once these problems are identified, the contribution of training to their solution can be tested. Further, the effectiveness of each training method is likely to depend on the characteristics of individual users. While experience in online searching immediately comes to mind as an example of such a characteristic, observations of actual training sessions and the resultant searching behavior suggest other factors that should be considered in testing instructional methods.

The Need for Librarians. The complex nature of subject access and the high degree of expertise required indicate that patrons are likely to require the assistance of librarians -- whether as mediators or as consultants -- for some time to come. It is not clear, however, what makes librarians uniquely suitable for such tasks: their education, their experience, or both. It is not uncommon for administrators to assume that any person with training in online searching who performs searches frequently is as good a searcher as a librarian with the same experience. This assumption has not been tested in a rigorous manner.

A project to test the need for librarians should be more sensitive than the common experiment. It should compare retrieval performance (precision, recall, and unit cost) of librarians' searches with those of non-librarians, as well as examining the search process itself. Here, the definition of the search process should not be limited to counting occurrences of activities but should be open-ended. One may observe, for instance, that librarians are more methodical -- following a plan or a pattern -- in their searching behavior than non-librarians. Once the differences in the search processes are discovered, the effects of these differences on search results and costs should be examined. Further, the examination should include the nature of the material retrieved in addition to the numeric values of recall and precision.

Similarly, studies of patrons searching their own requests should be conducted. Such studies can draw on the experience gathered in analyzing the searching behavior of pathologists and pharmacists.[37] Data that describe patron behavior, including errors and problems, should be collected and analyzed, as well as data that compare the results of patron searches and those performed by librarians. Although each study of actual patrons is limited to one user group, findings common to a number of studies can be considered as valid on a general level.

Indexing

The crucial role of indexing in facilitating subject access was never questioned when only printed retrieval tools were available. Indexing was, and to some degree still is, considered to be the "heart" of organizing information for retrieval. Indexing theory was relatively rich during the 1970s;[43] it drew on a variety of models, with the probabilistic model[44] attracting the most attention.

Although theoretically sound and attractive, most of these models were never developed enough to show their applicability to library decisionmaking, and some were indeed abandoned. One exception is the Five-Axiom Theory of Indexing developed by Fugman.[45] Though general in nature, the theory draws on practical experience in database retrieval and could be applied to specific situations.[46]

The Quality of Indexing

Indexing quality is a major concern for investigators who focus on the applications aspect of research in indexing. One measurement developed for that purpose is indexer consistency, defined as the degree to which index terms assigned to a set of documents by one indexer agree with those assigned by another, or by the same indexer at a later time.

Many studies of indexer consistency were carried out during the 1960s and 1970s.[47] They examined an array of indexer characteristics, such as subject knowledge, and a variety of indexing methods, such as the degree of vocabulary control in the index language. Here again, no conclusive results were obtained except that indexing was most consistent when the index language used was highly controlled. Also, investigators were frequently disappointed with the low consistency scores obtained.

Although indexing is performed to make subject retrieval possible, its quality has never been tested against actual retrieval performance. In other words, we do not know which indexers' work guarantees the best retrieval results. One attempt to correlate indexer consistency (as opposed to indexer characteristics) with retrieval performance revealed that indexing with controlled vocabulary -- the method that maximized consistency -- resulted in the best retrieval.[48]

A more sensitive approach was taken in a study of 760 articles that were mistakenly indexed twice for the MEDLINE database.[49] Results showed that consistency depended on the subject field (e.g., anatomy vs. public health), and on the degree to which a concept was central to an article.

Some opposition to indexer consistency as the sole measurement of indexing quality has been voiced, most notably by Cooper, who showed that indexer consistency is not a measure of quality because bad indexers can achieve high consistency among themselves.[50] The failure to measure indexing quality was not lamented for long, however. With the introduction of online retrieval that provides free-text searching, the question of whether indexing is needed at all has become central to research in indexing.

The Need for Indexing

Indexing is a labor-intensive and costly process, thesauri are expensive to construct, and several theoretical issues relating to their construction remain unresolved. Therefore, the capability of retrieving documents without the aid of indexing and a thesaurus is very appealing. Beginning with the Cranfield studies,[51] tests have been carried out to compare the success of retrieval by free-text searching with the success of retriveal using index languages of various types.

Results are inconclusive, and the debate continues as to whether future systems should restrict themselves to free-text searching capability. In fact, one is almost forced to belong either to the "free-text camp" or to the "controlled vocabulary camp." On the basis of practical experience with database searching, however, librarians have already recognized that both access methods are needed for successful retrieval. Further, a summary of a number of case studies and of several research papers indicates that free-text and descriptor searching complement each other.[52] This evidence is significant for both database producers and librarians. While database producers may decide to avoid the cost involved in providing for descriptor searching, they should make efforts to include abstracts because they are essential to free-text searching. A survey of 123 A&I services showed that only 46% included abstracting guidelines that were pertinent to this mode of retrieval.[53]

Librarians, on the other hand, need to become knowledgeable about the trade-offs between these modes of searching. Their training should include clear demonstrations of the circumstances under which it is best to search with free-text terms and the conditions under which descriptor searching is more useful.

Automated Indexing

Because of the "imperfection" of human indexers, much attention has been directed toward automated indexing, whereby a computer "reads" the text of a document and assigns index terms to it. The first experiments in which machines were programmed to index were carried out in the mid-1950s. Since then, automated indexing has undergone much research by a number of talented researchers, led by the work of Gerard Salton.

Automated indexing provides several powerful capabilities: retrieval systems can be designed for natural language interface in which users express their requests in sentence-like phrases; index terms can be assigned weights according to their "importance" to a document; internal networks can lead to additional search terms; and indexing can be modified with the help of feedback from users. Indeed, several experiments have shown that automated indexing performs as well as, or even better than, the conventional methods of indexing.[54]

Because of the growing number of databases that provide full-text retrieval, automated indexing seems more realistic today than in the past. While automated systems continue to improve, however, they have been tested only in experimental settings and with simplistic assumptions about users' information needs and the variety that exists in the stored documents. Therefore, such systems cannot be considered for libraries until they have been tested on databases of realistic size and in situations that reflect the complexity of organizing and retrieving diverse collections of materials.

Research Needs for the Future

Future investigations in indexing should focus on determining when indexing is necessary, rather than on whether indexing is necessary at all. Such investigations could be conducted by examining how indexing is actually used (i.e., examining actual searches).

Researchers should be sensitive to a variety of factors that may determine the need for indexing. For example, the use of controlled vocabulary may not be required in scientific databases that are searched to answer information requests from engineers in industry, while searches of the social science literature for graduate students may be most successful when descriptors are used.

Indexing quality can also be assessed anew by examining its usefulness to retrieval. Indexer-requester consistency[50] can be measured when the index terms entered by a user are compared with the index terms that retrieve the best results. Although such tests may not produce general conclusions, their results could be used to improve the indexing of the tested databases.

Most important, online systems of the future will probably provide one interface with the same mechanism for subject access to all information, whether it is stored in library catalogs or in bibliographic databases -- a practice already in use at NLM. When searching systems of the future, users will be able to search a variety of databases with one search strategy. In addition to providing one retrieval mechanism, online systems should store information in a variety of "packages," that is, employ a variety of indexing methods and practices each corresponding to a type of information need.

Thus, research should examine the usefulness of existing index languages for subject access through online systems. Although some index languages were developed specifically for online databases and others are being constantly updated to facilitate online searches, some index languages were created for manual tools and then simply transferred for use in online systems. The Library of Congress Subject Headings are the most relevant example: they are used to index information in most online catalogs and in databases with a general subject coverage (e.g., newspapers and magazines indexes). Tests should be conducted to compare the usefulness of the Library of Congress Subject Headings -- in relation to individual user groups and needs -- with index languages derived from classification schemes such as the Dewey Decimal Classification or the Universal Decimal Classification; string languages[55] such as PRECIS;[56] and possibly a general thesaurus constructed by integrating a number of index languages, each covering a specific subject.

Similarly, indexing practices should be examined. Certainly, indexing practices employed in the Library of Congress cannot satisfy the requirements of all users all the time. Moreover, it is possible to identify which indexing practices are most suitable for specific types of information needs. The level of indexing (e.g., whether to index a monograph as a whole or to index each of its chapters), the degree of exhaustivity (whether to express in indexing only the most important aspects, or every aspect that is conceivably relevant), the indexing technique (e.g., whether to check each document against a predetermined list of descriptors), and many other practices should be tested to determine the methods that are most effective in meeting each type of information need.

Full-Text Retrieval

Central to the vision of a paperless society is the prediction that information will be available in electronic form. Texts of newspapers, magazines, scientific journals, legal literature, and encyclopedias are already available online through bibliographic search systems and other systems. The provision of the full text of documents online is supposed to serve two purposes: to eliminate the need for the printed materials, and to improve subject access to those materials.

Replacing printed materials with their electronic counterparts would seem to be beneficial to libraries: instead of purchasing materials that may or may not be used, access to a central store of all materials would be possible when specific needs arise. But this scenario raises a host of problems, ranging from technical difficulties and the discomfort of reading text on a screen to cost considerations that may limit such services to a privileged few.[57] Thus, the benefit of such replacement is still questionable.

In terms of improving retrieval performance, however, the benefits of full-text systems may be more apparent. Although bibliographic search systems currently provide only a few additional search capabilities that are especially suited to full-text searching, the ability to perform free-text searches on the full text of documents is regarded as promising.[58] On the other hand, there is very little evidence to substantiate this assumption. A test of the Harvard Business Review Online showed that to achieve maximum recall, one must search both the bibliographic citation with its indexing and the full text.[59] In contrast, a full-text retrieval test of the legal literature produced very low scores for recall.[60]

Full-text retrieval is a new phenomenon in librarianship. It offers solutions to some existing problems, but it also raises a number of new questions. Much research and improvement are needed before full-text retrieval can be fully implemented in libraries. The use of full-text and other non-bibliographic databases in libraries is so recent that there is still very little information available to provide a basis for research. For this group of databases, exploratory surveys are needed to uncover the range and magnitude of their use, the rate of user satisfaction, and any problems associated with having full-text databases as both a substitute for the printed source and an enhancement to retrieval.

An assembly of research methods similar to the CLR study should be employed for an initial exploration. Some of the issues to be examined are: Can readers retrieve information by themselves? What equipment and knowledge are required for the use of these databases? What are the useful features of the display of non-bibliographic and full-text information? Do users read the text at the terminal screen or do they print a hard copy to read from? When and how can subject access be improved for full-text databases?

Expert Systems

An expert system acts as an expert in a specific field. It is projected that expert systems could be used in library management, cataloging, and reference,[61] and that as a result, librarians could become more service managers and user advisors than intermediaries between patrons and the desired information service.[62]

A crucial component of an expert system is its knowledgebase -- a database of facts, which is an expression of accumulated information in a specific field, and a set of rules. To create a knowledgebase, one must decide what knowledge to include in the database and how to represent it. While knowledge can be derived from human experts or from other sources, its representation requires techniques that have been developed in the field of artificial intelligence (AI).

Current attempts to design expert systems for libraries focus most notably on intermediary systems for online searching: IIDA provides help to novice searchers and thus can be used for computer-assisted instruction,[63] and CITE (the NLM online catalog) offers natural-language query input and automatic subject headings display, among other capabilities.[25] Still experimental is CONIT, which provides an interface with a multitude of databases.[64] In-house, microcomputer-based systems to aid reference work have also been developed at the National Agricultural Library[65] and in one library's government documents department.[66] Most of these systems are not "truly" expert systems, however, either because their operations are not based on knowledge derived from experts, or because they do not utilize AI techniques.

Existing intermediary expert systems derive their knowledge from the information stored in bibliographic databases. To users who ask for information about online catalogs, such a system may suggest that they search under the term "OPAC," because this new term appears in the titles and abstracts of many items indexed with the descriptor "Online Catalogs." Deriving its knowledge only from the stored text, however, prevents the system from considering aspects that are not directly related to the subject of a request. For instance, the system would not "know" that it is useful to find out what level of material is required: introductory and instructional information, or data about recent research.

Although the debate about whether knowledge for expert systems should be derived from human experts or from other sources is not yet settled, some attempts have been made to extract knowledge from librarians. Among the first steps in this direction are a project supported by the British Library that produced a model of the search process;[67] and a list of moves to improve search results[36] with a decision tree that guides decisions about whether to enter free-text terms or descriptors.[41] In addition, two institutions -- the American Petroleum Institute[68] and NLM[69] -- use indexers' knowledge and practice to develop expert systems to aid in-house indexing.

Further, some systems employ AI techniques. CANSEARCH, for example, which has been developed as an intermediary for searching the cancer literature,[70] is based on "frames" -- a technique that has attracted much attention.[71] Also, the Indexing Aid Project at NLM is experimenting with the use of a variety of AI techniques.[69]

Research on expert systems for libraries is in its early years. Many basic issues, such as how to express knowledge accumulated in librarianship, remain to be investigated. Our short experience does indicate that systems developed for searching or indexing in a specific subject area and within a certain setting are the most powerful among both the experimental and operational systems. It is sound to assume that the future will see a variety of expert systems, each tailored to a specific group of users, as opposed to "universal" expert systems for searching, indexing, or reference work.

Costs

Future studies may reveal the best methods for training patrons, or the best searching aids. The value of such discoveries should be weighed against their costs. Cost-benefit analysis is difficult if not impossible to perform for subject access, but weighing costs against the frequency of use can help library administrators select a system or a method for patron training. Data to support such decisions should be made available by cost studies.

Of further help would be a detailed cost analysis of all the components and factors involved in systems for subject access. Such an analysis should examine the tradeoffs between quality control and costs, and between the adequacy of the support given to users and costs.

Conclusion

Library automation has paved the way for new approaches to organizing, indexing, and retrieving information. The ramifications of the widespread use of computers to retrieve information are far-reaching. Users today expect more from computer-assisted retrieval than from printed sources. As a result, the demands placed on librarians and researchers are more immediate than ever in the past. Librarians must acquire expertise in a large variety of subjects, ranging from knowledge of computers to principles of bibliographic control and methods of training. While users will become more independent as computer technology advances, their need for librarians' assistance to solve complex problems will become more apparent than ever before.

Research in organizing and retrieving information faces a host of new issues and an urgent requirement to address old issues that have not yet been resolved. Because actual searching of online systems can be easily monitored and observed, and because of the large volume of such searches, researchers can conduct in-depth analyses of a large body of data. Some of the tasks that should be accomplished are listed below:

- To investigate information needs expressed by users as well as the purpose for which information is retrieved, in order to develop a typology of needs. Such a typology, linked to our knowledge about cognitive information processing, is essential to the development of information systems tailored to respond to individual information needs.

- To examine methods that can help users express their search requests and formulate their search strategies. New as well as existing methods should be investigated to determine their effectiveness and suitability for different user groups (e.g., professionals, students) and for specific information needs.

- To develop a research method to study online searching behavior that will produce results relevant to user training, systems design, and library decisionmaking. The method should take into consideration the nature of information needs, should develop adequate measurements for both the search process and search results, and should establish a test procedure that is as close as possible to actual (nonexperimental) searching.

- To identify the variables that have the greatest effect on online searching behavior and their interaction, so that individual variability in online searching can be controlled for studies of searching behavior.

- To discover the characteristics of a "good search" by identifying strategies and moves that enhance the success of online searches, and the conditions under which each of them should be used to achieve satisfactory retrieval. By this means, user training, system design, and actual searching will be based on a set of well-established search strategies for specific situations in which they are likely to be successful. A model of a "good search" is also important for the design of intermediary expert systems.

- To investigate the difficulties encountered by users when they attempt to interact with a computer in order to search online bibliographic systems. Examples include using command language and understanding computer responses and displays. Resolution of these difficulties will lead to human-computer interfaces that are tailored to individual needs and requirements.

- To examine the searching behavior of patrons searching their own requests in order to identify cognitive patterns and to determine the conceptual and technical problems they encounter, as well as the quality of the answer sets they retrieve -- in particular, as compared with searching performed by professional librarians.

- To review the new roles that librarians should assume (and the modifications introduced into existing roles) with the introduction of online systems for public access, in order to examine the performance of these roles and their effectiveness.

- To investigate the methods that should be used by librarians in training patrons to perform their own searches, and to examine the effectiveness of each training method with relation to individual characteristics of patrons, so that instructional methods can be tailored to patrons' individual requirements.

- To compare the performance of professional librarians with that of technical staff in searching subject requests online. Both search processes and search results should be analyzed, so that the contribution of professional training can be identified explicitly. The results of such comparisons will also point to specific skills needed by professional librarians and thus should enhance curriculum design in library schools.

- To explore the effects of integrated online searching systems that provide a single interface for both catalogs and bibliographic databases on users' searching behavior, users' need for assistance, and database and catalog design.

- To develop measurements of indexing quality. These measurements should focus on the contribution of indexing to the success of retrieval rather than on indexer characteristics or indexing conditions and situations. These measurements are necessary to begin uncovering the effects of indexing methods and practices on retrieval.

- To investigate the relationship between indexing quality and the characteristics of the information being indexed (e.g., how well subject terminology is defined in the area), so that indexing practices and methods can be made sensitive to specific characteristics of the information being indexed.

- To discover the relationship between indexing methods or practices and the success of different user groups in retrieving various kinds of information, so that indexing can be tailored to the needs of individual users.

- To investigate the conditions under which descriptor searching is most appropriate and those under which free-text searching is likely to produce better results, so that users can make informed decisions when selecting search terms, and database and catalog designers can decide which indexing method will be more effective for their users.

- To examine whether the modification of indexing practices in existing systems as a result of user feedback has an effect on retrieval performance. Experiments with automated indexing systems have demonstrated that modifications guided by user feedback can improve retrieval performance significantly. Investigating whether such improvements could be achieved with conventional systems would provide the basis for further investigations into feedback-based modifications, their effectiveness, and their value.

- To investigate the construction of internal semantic networks that will enrich either document indexing or the selection of search terms by users, so that the potential of these networks to enhance search results can be determined with relation to individual information needs.

- To explore the feasibility of constructing a general thesaurus (not limited to a subject area) by integrating a number of thesauri, each covering a specific subject. With such a tool, general databases could employ an index language that would be more suitable for online searching than the existing languages, and a standard index language could be created for use in cooperative projects among libraries regardless of their type.

- To evaluate the effectiveness of various general thesauri (not limited to a subject area) with relation to individual user groups and needs, so that index languages used for general purposes might be tailored to individual needs.

- To investigate the relationship between indexing practices (e.g., level of indexing, exhaustivity of indexing) and retrieval requirements of user groups and needs, in order to facilitate the development of indexing practices that are tailored to individual needs.

- To survey the use of full-text databases in order to determine the range and magnitude of their use, their rate of user satisfaction, problems associated with searching them, and problems associated with using them as a substitute for printed sources. Because full-text retrieval is a new phenomenon and its use is still limited, this survey is necessary to identify specific research issues in this area.

- To survey the use of non-bibliographic databases in libraries to determine the range and magnitude of their use, their rate of user satisfaction, the subject access methods used, and problems associated with searching them. Although various search systems provide access to a number of non-bibliographic databases, no statistics about their use are available. This first step will pave the way for a more in-depth understanding of the organization and retrieval methods required for non-bibliographic databases.

- To generate and investigate new display features that may be more suitable for full-text and other non-bibliographic databases. A variety of techniques (e.g., windowing) and approaches to text display (e.g., providing intermediary displays of text before the full text is displayed) should be tested. These examinations should be led by known patterns of cognitive information processing associated with problem-solving behavior. At the same time, they should enrich our understanding of the cognitive processes associated with searching non-bibliographic databases.

- To determine whether the information needs that are answered through searches of bibliographic databases and catalogs are different in nature from those that are answered through searches of full-text databases. Also, these two types of information needs should be compared with those that require searches in numeric databases, in order to determine whether searching non-bibliographic databases is essentially different from searching bibliographic databases and catalogs.

- To explore the feasibility and to assess the advantages and drawbacks of creating a set of standards that would guide the design of all library information systems and databases. Such standards may determine which index languages should be employed, what indexing practices should be followed, and what interactive features should be provided. Because the increased use of technology facilitates increased cooperation among libraries and other information-providing agencies, such standardization may be necessary.

Future research can no longer separate the organization of information from its retrieval. Research in the organization of information can and should consider retrieval performance, and investigations into retrieval performance are not useful if they ignore the organization methods used. Organizing and retrieving information are now one and the same subject.

Along with this trend toward consolidation, technological developments and actual activities in libraries facilitate the focus on individual searching behavior. Though these two trends seem contradictory, their combination is very powerful and most useful for library decisionmaking, bringing together specialties that have been somewhat artificially isolated, and providing guidelines for the provision of tailor-made services to library patrons.

Today's database producers and search systems vendors who compete among themselves to present a large array of features only confuse the issue of which features are useful and necessary. The future calls for system design based on established user needs rather than on bells-and-whistles products responsive to marketing-inspired needs. The future calls for general standards for the development of databases and computer interfaces that are also truly adaptable to individual needs.

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Bibliography

1. Belkin, N. J., and Vickery, A. Interaction in Information Systems: A Review of Research from Document Retrieval to Knowledge-Based Systems. Library and Information Research Report 35. London: The British Library, 1985.

2. Walton, C., et al. "Resistance to online catalogs: A comparative study at Bryn Mawr and Swarthmore Colleges," Library Resources and Technical Services 30(4) 1986, 388-401.

3. Kranich, N. C., Spellman, C. M., Hecht, D., and Persky, G. "Evaluating the online catalog from a public services perspective: A case study at the New York University Libraries," in The Impact of Online Catalogs, ed. J. R. Matthews, 89-117. New York: Neal-Schuman, 1986.

4. Matthews, J. R., and Lawrence, G. S. "Further analysis of the CLR Online Catalog Project," Information Technology and Libraries 3(4) 1984, 354-376.

5. Matthews, J. R., Lawrence, G. S., and Ferguson, D. K., eds. Using Online Catalogs: A Nationwide Survey. Report of a Study Sponsored by the Council on Library Resources. New York: Neal-Schuman, 1983.

6. Markey, K. "Thus spake the OPAC user," Information Technology and Libraries 2(4) 1983, 381-387.

7. Ferguson, D. Public Online Catalogs and Research Libraries. Final Report to the Council on Library Resources. Stanford: Research Libraries Group, 1982.

8. Tolle, J. E. "Understanding patrons' use of online catalogs: Transaction log analysis of the search method," in Productivity in the Information Age, Proceedings of the 46th ASIS Annual Meeting, ed. R. F. Vondran, A. Caputo, C. Wasserman, and R. A. V. Diener, 167-171. White Plains, New York: Knowledge Industry Publications, 1983.

9. Larson, R. R. "Users look at online catalogs: Results of a national survey of users and non-users of online public access catalogs," in Interacting with Online Catalogs, Part 2. Berkeley: University of California, Division of Library Automation and Library Research and Analysis Group, 1983.

10. Hildreth, C. R. Online Public Access Catalogs: The User Interface. Dublin, Ohio: OCLC, 1982.

11. Cochrane, P. A., and Markey, K. "Catalog use studies since the introduction of online interaction catalogs: Impact on design for subject access," Library and Information Science Research 5(4) 1983, 337-363.

12. Borgman, C. L. "Why are online catalogs hard to use? Lessons learned from information-retrieval studies," Journal of the American Society for Information Science 37(6) 1986, 387-400.

13. Dickson, J. "An analysis of user errors in searching an online catalog," *Cataloging and Classification Quarterly* 4(3) 1984, 19-38.

14. Matthews, J. R., ed. *The Impact of Online Catalogs*. New York: Neal-Schuman, 1986.

15. Markey, K. "Subject-searching experiences and needs of online catalog users: Implications for library classification," *Library Resources and Technical Services* 29(1) 1985, 34-51.

16. Lipetz, B. "Catalog use in a large research library," *Library Quarterly* 42(1) 1972, 129-139.

17. Bates, M. J. "Factors affecting subject catalog search success," *Journal of the American Society for Information Science* 28(3) 1977, 161-169.

18. Svenonius, E. "Use of classification in online retrieval," *Library Resources and Technical Services* 27(Jan/Mar) 1983, 76-80.

19. Markey, K., and Demeyer, A. *Dewey Decimal Classification Online Project: Evaluation of a Library Schedule and Index Integrated into the Subject Searching Capabilities of an Online Catalog*. Final Report to the Council on Library Resources. Dublin, Ohio: OCLC, 1986.

20. Chan, L. M. "Library of Congress classification as an online retrieval tool: Potentials and limitations," *Information Technology and Libraries* 5(3) 1986, 181-192.

21. Cochrane, P. A., and Markey, K. "Preparing for the use of classification in online cataloging systems and in online catalogs," *Information Technology and Libraries* 4(2) 1985, 91-111.

22. Hill, J. S. "Online classification number access: Some practical considerations," *Journal of Academic Librarianship* 10(1) 1984, 17-22.

23. Lawrence, G. S. "System features for subject access in the online catalog," *Library Resources and Technical Services* 29(1) 1985, 16-33.

24. Carson, E. "OPACS: The user and subject access," *Canadian Library Journal* 42(2) 1985, 65-70.

25. Doszkocs, T. E. "CITE NLM: Natural language searching in an online catalog," *Information Technology and Libraries* 2(4) 1983, 364-380.

26. Lancaster, F. W. *Evaluation of Online Searching in MEDLARS (AIM-TWX) by Biomedical Practitioners*. Urbana: University of Illinois, Graduate School of Library Science, Occasional Paper No. 101, 1983.

27. Wanger, J., Cuadra, C. A., and Fishburn, M. *Impact of Online Retrieval Services: A Survey of Users, 1974-1975*. Santa Monica: Systems Development Corp., 1976.

28. Fenichel, C. H. "Online searching: Measures that discriminate among users with different types of experience," *Journal of the American Society for Information Science* 32(1) 1981, 23-32.

29. Wanger, J., McDonald, D., and Berger, M. C. *Evaluation of the Online Process*. Santa Monica: Cuadra Associates, 1980.

30. Bellardo, T. "An investigation of online searcher traits and their relationship to search outcome," *Journal of the American Society for Information Science* 36(4) 1985, 241-250.

31. Woelfl, N. N. *Individual Differences in Online Search Behavior: The Effect of Learning Styles and Cognitive Abilities on Process and Outcome*. Ph.D. Dissertation, Case Western University, Cleveland, Ohio, 1984.

32. Fenichel, C. H. "The process of searching online bibliographic databases: A review of research," *Library Research* 2(2) 1980, 107-127.

33. Fidel, R. "Individual variability in online searching behavior," in *ASIS '85, Proceedings of the 48th ASIS Annual Meeting*, ed. C. A. Parkhurst, 69-72. White Plains, New York: Knowledge Industry Publications, 1985.

34. Fidel, R., and Soergel, D. "Factors affecting online bibliographic retrieval: A conceptual framework for research," *Journal of the American Society for Information Science* 34(3) 1983, 163-180.

35. Bates, M. J. "How to use information search tactics online," *Online* 11(3) 1987, 47-54.

36. Fidel, R. "Moves in online searching," *Online Review* 9(1) 1985, 61-74.

37. Sewell, W., and Teitelbaum, S. "Observations of end-user online searching behavior over eleven years," *Journal of the American Society for Information Science* 37(4) 1986, 234-245.

38. Fahey, B. J., and Campbell, D. G. *New Catalog, Same Old User: Recommendations for Teaching the Online Catalog*. Oshkosh: Wisconsin University, 1985. (ED264869.)

39. Sullivan, P., and Seiden, P. "Educating online catalog users: The protocol assessment of needs," *Library Hi Tech* 3(2) 1985, 11-19.

40. Bates, M. J. "Subject access in online catalogs: A design model," *Journal of the American Society for Information Science* 37(6) 1986, 357-376.

41. Fidel, R. "Towards expert systems for the selection of search keys," *Journal of the American Society for Information Science* 37(1) 1986, 37-44.

42. Janosky, B. "Online library catalog systems: An analysis of user errors," *International Journal of Man-Machine Studies* 25 1986, 573-592.

43. Borko, H. "Toward a theory of indexing," Information Processing and Management 13(6) 1977, 355-365.

44. Cooper, W. S., and Maron, M. E. "Foundations of probabilistic and utility-theoretic indexing," Journal of the Association for Computing Machinery 25(1) 1978, 67-80.

45. Fugman, R. "The five-axiom theory of indexing and information supply," Journal of the American Society for Information Science 36(2) 1985, 116-129.

46. Fugman, R. "On the practice of indexing and its theoretical foundations," International Classification (Germany) 7(1) 1980, 13-20.

47. Markey, K. "Interindexer consistency tests: A literature review and report of a test of consistency in indexing visual materials," Library and Information Science Research 6(2) 1984, 155-177.

48. Leonard, L. E. Inter-indexer Consistency and Retrieval Effectiveness: Measurement of Relationships. Ph.D. Dissertation, University of Illinois, Champaign, Illinois, 1975.

49. Funk, M. E., and Reid, C. A. "Indexing consistency in MEDLINE," Bulletin of the Medical Library Association 71(2) 1983, 176-183.

50. Cooper, W. S. "Is interindexer consistency a hobgoblin?" American Documentation 20(3) 1969, 268-278.

51. Cleverdon, C. W. Report on the Testing and Analysis of an Investigation into the Comparative Efficiency of Indexing Systems. Cranfield, England: College of Aeronautics, ASLIB Cranfield Research Project, 1962.

52. Svenonius, E. "Unanswered questions in the design of controlled vocabularies," Journal of the American Society for Information Science 37(5) 1986, 331-340.

53. Fidel, R. "Writing abstracts for free-text searching," Journal of Documentation 42(1) 1986, 11-21.

54. Salton, G. "Another look at automatic text-retrieval systems," Communications of the ACM 29(7) 1985, 648-656.

55. Craven, T. C. String Indexing. Orlando, Florida: Academic Press, 1986.

56. Dykstra, M. PRECIS: Recent Applications. Halifax, Nova Scotia: School of Library Science, Dalhousie University, 1987.

57. Katz, B. "The full-text online magazine," Collection Building 6(4) 1985, 26-29.

58. Goldsmith, N. "An appraisal of factors affecting the performance of text retrieval systems," Information Technology: Research and Development 1(1) 1982, 41-53.

59. Tenopir, C. "Full text database retrieval performance," Online Review 9(2) 1985, 149-164.

60. Blair, D. C., and Maron, M. E. "An evaluation of retrieval effectiveness for a full-text document-retrieval system," Communications of the ACM 28(3) 1985, 289-299.

61. Borko, H. "Artificial intelligence and expert systems research and their possible impact on information science education," Education for Information 3 1985, 103-114.

62. Mason, R. M. "Office automation and information technology trends -- their impact on libraries and information center management," Microcomputers for Information Management 3(1) 1986, 1-14.

63. Meadow, C. T., Hewett, T. T., and Aversa, E. S. "A computer intermediary for interactive database searching. II. Evaluation," Journal of the American Society for Information Science 33(6) 1982, 357-364.

64. Marcus, R. S. "An experimental comparison of the effectiveness of computers and humans as search intermediaries," Journal of the American Society for Information Science 34(6) 1983, 381-404.

65. Waters, S. T. "Answerman, the expert information specialist: An expert system for retrieval of information from library reference books," Information Technology and Libraries 5(3) 1986, 204-212.

66. Smith, K. F. "Robot at the reference desk?" College and Research Libraries 47(5) 1986, 486-490.

67. Williams, P. W. "A model for an expert system for automated information retrieval," in Proceedings, 8th International Online Information Meeting, 139-149. London: Learned Information, 1984.

68. Brenner, E. H., Lucey, J. H., Martinez, C. L., and Meleka, A. "American Petroleum Institute's machine-aided indexing and searching project," Science and Technology Libraries 5(1) 1984, 49-62.

69. Humphrey, S. M., and Miller, N. E. "Knowledge-based indexing of the medical literature: The Indexing Aid Project," Journal of the American Society for Information Science 38(3) 1987, 184-196.

70. Pollitt, A. S. "A front-end system: An expert system as an online search intermediary," Aslib Proceedings 36(5) 1984, 229-234.

71. Minsky, M. "A framework for representing knowledge," in The Psychology of Computer Vision, ed. P. Winston. New York: McGraw-Hill, 1975.

Comments by Reviewers

The three reviewers who commented on this article addressed the issues of retrieving, indexing, and full-text retrieval. They also suggested alternative approaches to the topic area, additional courses of investigation, and additional research objectives.

Retrieval

Fidel encourages constructing a "general thesaurus by integrating a number of thesauri, each covering a specific subject." This research objective could be expanded to include the study of retrieval language compatibility in general. This topic, long of interest to Europeans, is now the focus of research projects sponsored by the National Library of Medicine and is the topic of Multiple Thesauri in Online Bibliographic Systems, recently published by the Library of Congress.

Fidel's concept of successful online searching by patrons warrants further research as well, to establish the likelihood of patrons helping themselves with online searching. Available data suggest that the novelty of patron searching wears off quickly and the task reverts to the professional searcher, both in the public library setting and in the corporate setting, where time is critical and patrons prefer having results delivered to their desk.

The Council on Library Resources (CLR) study cited by Fidel is important, but was conducted too early in the development of online catalogs. More current research on online catalog systems could be considered in drawing conclusions about user interfaces with online catalogs. Another aspect of retrieval to be addressed is the use of microcomputer-based interfaces to facilitate user access to bibliographic and non-bibliographic data systems and as a means to link those systems.

Works by Brian Nielsen and Betsy Baker are recommended as further references on the use of online systems.

Indexing

Fidel recommends that research in the field "investigate the conditions under which descriptor searching is most appropriate and those under which free-text searching is likely to produce better results." Such studies could also include designing controlled vocabularies to be used in conjunction with free-text searching as well as in selecting search terms.

She also suggests that research be conducted to "investigate the relationship between indexing quality and the characteristics of the information being indexed." Studies along this line must bear in mind that methods of indexing developed for the sciences are inappropriate for the social sciences and humanities. Furthermore, a study of different sublanguages in the humanities and social sciences is prerequisite to designing vocabulary control mechanisms for them.

The need also exists, on a general scale, for a uniform filing, classification, and indexing or cataloging system to make retrieval of the documents a smooth and uniform activity. This is essential in university or regional research collections, as well as in commercial environments.

Full-Text Retrieval

Fidel recommends surveying "the use of full-text databases . . . to identify specific research issues in this area." Although full-text searching has been acclaimed by some as a breakthrough in online searching, more research is needed to assess its precision, recall, and rate of user satisfaction.

She also encourages investigating "new display features that may be more suitable for full-text and other non-bibliographic databases." This research could usefully be extended to bibliographic databases as well. Wajenberg would be a good source of information.

Additional Research Objectives

Descriptive cataloging is not emphasized in this paper. The following research objectives might be explored in this area:

- To investigate the principles underlying catalog code design with a view to their appropriateness for the online era, using the work of Gorman, Wilson, and Malinconico as possible resources.

- To investigate the impact of technology on networking and particularly on how technical services related to the organization of materials will be performed in the future. Specifically, does the advent of CD-ROM technology pose a threat to large bibliographic utilities such as OCLC? How successful will cooperative ventures like the linked systems project be?

- To investigate the possibilities of automatic cataloging and expert systems to assist with cataloging. Work is being done in this area at OCLC, UCLA, Texas and in Europe.

INFORMATION NEEDS: OLD SONG, NEW TUNE

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Abstract

The challenge facing the library profession is not only to learn how to identify information needs, but also to create new services and reshape existing service delivery patterns around them. The key to more responsive information systems in the future is a better understanding of those who need information and the environments in which they function. In recent years, the scope of information needs has expanded significantly, and the research frontier emerging from this broadened focus is likely to be multidisciplinary, including knowledge from psychology, sociology, and the field of communication. New research models will explore both the cultural and organizational contexts of information seeking, as well as information resources and information transfer mechanisms. The challenge of the 1990s is to design research that will help librarians and the information systems they work with to anticipate a wide range of information needs.

Introduction

The National Commission on Libraries and Information Science in the early 1970s recognized the need to base library service on the information needs of library users. Its 1974 publication Library and Information Service Needs of the Nation[1] opened with a statement that still rings true today:

> "It is commonplace these days to say that library and information services must be attuned to the needs of the people. It is also commonplace to say that these information needs are not well understood and that we must develop greater understanding of them, if we are to fulfill them."

In the intervening years, researchers have written volumes on information needs, the federal government has funded hundreds of library projects designed to meet user needs, and there has been a much greater thrust toward making library service more responsive to users. The steps toward this aim have often been halting, and libraries (and other information systems, including online catalogs and bibliographic databases) have not been fundamentally altered as the result of the mixed body of knowledge that has been produced.

The challenge facing the field is not only to learn how to identify information needs, but also to create new services and reshape existing service delivery patterns around these extraordinarily diverse needs -- and to do it without shutting down existing library services. That challenge has continued over decades and, given the complexity of the problem, is likely to continue for many more. In the automobile manufacturing industry, car makers can shut down their factories for retooling before a new model is put on the assembly line. Unfortunately, libraries do not have the luxury of being able to shut down for retooling. Thus, they are gradually evolving, retaining services that developed in earlier years and gradually altering service delivery not only with technological innovations but also by providing new services in an attempt to respond to user needs.

Information Needs and Information Seeking Behavior: A Brief Examination of the Literature

Studies of information needs and information seeking have provided researchers with basic knowledge of various factors that operate when people need information. Although this body of literature has grown steadily for more than 40 years, researchers continue to ask as many basic questions as they answer. There is no doubt, however, that the key to more responsive information systems in the future is a better understanding of information users and the environments in which they function.

This brief examination of the literature is not designed to be a systematic literature review. There have been a number of them over the past 25 years or so, most frequently in the Annual Review of Information Science and Technology (ARIST). Reviews in the past decade, which provide the background needed to appreciate the growth and development of this literature, include Dervin and Nilan (1986),[2] Chen and Hernon (1981),[3] Wilson (1981),[4] Mick et al. (1980),[5] and Zweizig and Dervin (1978).[6] The literature shows that, in spite of the volume of work done so far, we are still at a fairly rudimentary stage in our ability to translate information needs into meaningful library service components.

Over time, researchers have made distinctions among several different concepts, including the information user, information needs, information use, information seeking behavior (including demands made on libraries, other information systems, and other sources of information), and information transfer. They have also examined the relationships among the major concepts in the field.[4]

While some of the conceptual and definitional problems in the study of information needs and use have been clarified, a number of unsolved problems remain. A major criticism of this literature has been that it is descriptive in nature and, as a result, has been difficult to build on.[2,5] Arriving at meaningful theories is a painstakingly slow process that still continues. Indeed, the lack of a good theory of information needs is considered contributory to the fact that changes in information retrieval systems are almost totally technology-driven.

Overall, there is widespread dissatisfaction with the research methods used and the assumptions made by many researchers.[2,4,7,8] Certain areas have been neglected (for example, information use, which has great potential for predicting information needs and information exchange, has not been widely examined by information science and may become the purview of organizational theorists[4]). Too much emphasis has been placed on which systems and services people use and not enough on how information systems, including libraries, can be designed to meet information needs.[4] This research, according to some critics, has not focused enough on human behavior. A research bias has developed, resulting in a strong focus in many studies on information sources rather than on the behavior of the individuals who need information. This conceptual error is not surprising in a profession built on information sources, but it has probably contributed to the failure of past research to develop a theoretical base that could transcend individual studies.

There are other problems with the literature. Because the basic concepts of information needs research have been difficult to define, researchers have often muddied the waters by careless use of major terms. At times, number crunching and jargon seem to have taken precedence over clarity of presentation. As a result, the literature is often difficult to track, and indexing tools do a poor job of bringing together articles on the same topic. In addition, the perspectives of the researchers, as well as their methods, jargon, and academic disciplines, are often so divergent that the literature is unintelligible except to those who share the educational background of a particular researcher. Finally, the knowledge gained from all this research has not substantially affected the way libraries do business, because the literature has not been adequately disseminated to librarians and library managers. Researchers most often write for other researchers and librarians for other librarians, to the extent that there are really two sets of literature, one based on practice, the other on research.

Information Seeking Behavior

The study of information needs and the resulting information seeking activity is a complex undertaking, for human behavior is multidimensional.[4] A library, we have learned from the research literature, may be only one of several sources of information that a person may use when seeking information. Or, as is often the case, libraries -- and the information professionals in them -- may be bypassed entirely by the person who needs information. Researchers have studied how people who avoid libraries obtain information and how individuals interact with libraries (and librarians) or other information systems. They have also examined the approaches that intermediaries use as they interact with sophisticated technology on behalf of users.[4]

Research on information seeking has consistently shown that people prefer interpersonal over print sources. That finding came as a surprise to researchers 30 years ago when they looked at information seeking among scientists.[8] An appropriate research question might be: "Why do information seekers choose oral channels first?" People may simply take the path of least resistance. Perhaps, on the other hand, psychological needs drive that choice.[4,7] For now, what is important is that librarians keep uppermost in mind that if members of the profession are to meet information needs adequately, library services must reflect information seeking preferences.

In general, studies of information seeking behavior have shown that what people do drives their need for information. Such studies shed light on the ways people go about getting information, and they should be distinguished from studies of information needs.

Information Needs

An emerging body of work shows that information needs vary according to the nature of the activity in which the end user is engaged, the environment in which the activity takes place, and the personal characteristics of the user. Thus, specific information needs vary considerably. If librarians are to be able to respond to a variety of information needs, they must have knowledge not only of the sources of information required, but also of the specific needs of the information users.

New Horizons in Information Needs Research

In a recent review of the literature, Dervin and Nilan[2] identified what they consider to be a shift toward studies that are focused not only on understanding the context of information use, but also on "what leads up to and what follows intersections with systems." They conclude their 1986 review by saying that "a quantum and revolutionary conceptual leap" has been made in information needs research in this decade. They are encouraged by the tentative steps on several fronts "in the continuing quest to understand the elusive user."[2] As research continues, this conceptual leap will undoubtedly lead to a far sounder understanding of the user, but the payoff for such research is often decades away. For the short term, we must focus on integrating what we now know and what we are able to learn into what we do.

Contexts: Problem and Information Environments

For some time, researchers have realized the value of looking at information needs within the broader umbrella of the environment in which they occur. Knowledge of "problem environments" or "information environments" will play a key role in predicting information needs. Much of the early work in information studies focused on the information environments of scientists, who rely heavily on documentation and journal literature.[7,9] Since most information-related activities outside the scientific world do not rely as heavily on documentation, that early research resulted in a somewhat distorted view of information seeking in general as being quite mission-oriented and document-centered. More recent research has shown the diversity of information or problem environments. (The former term was used first in the 1960s by Parker and Paisley,[10] the latter is a more recent coinage preferred by Taylor and others.[11])

The concept of the information/problem environment is broader than just the information activity that people engage in when they seek information, and it provides a context for that activity. Looking at the problem as a surrogate for the environment presents a full range of challenges as the professional attempts to meet user needs, but its logic is clear.

MacMullin and Taylor[11] have challenged present library practice by positing the notion that libraries and other information systems "as they now exist are quite good at providing documents in answer to a question about a subject." But, they say, "problems, not questions (which are only subject based), should be the level of concern, since the problem represents the information use environment

165

more completely than does the question." There is a fundamental difference between problems and questions:

> ". . . a problem is a compression of the user situation with all of the important elements intact. A question, however, does not retain all those elements that make up a problem. It is not the situation made smaller, but only a part of the situation."[11]

Questions are often answered by "the most precise chunks of information that we can provide. Problems require solutions, resolutions, clarifications, and often compromise."[11]

Looking at the terminology and relationships more closely, *problem environments* provide the "contexts from which the need for information arises." A problem environment can range "from leisure reading to corporate decision-making, from education to scientific research and development, from the need to be informed to the assessment of environmental impact." *Information needs* result from "problems arising from specific situations." A *situation* is a way to look at a variety of environmental variables. This holistic approach to information needs provides a logical context for understanding information seeking behavior, and it demands that information specialists learn to respond not only to the single question with which information systems now deal -- *What do you want to know*? -- but with the companion questions -- *How and why is the information needed*? *How is it likely to help*? *What does the user know already*? *What is expected*? *What are the parameters of the problem*?[11]

Research on the information needs of citizen group leaders, for example, has examined the local public policy decision environment. This research showed that, in the course of attempting to influence public policy decisions in their communities, leaders of such groups as the League of Women Voters, the American Association of Retired People (AARP), and a variety of local groups needed several different types of information: (1) background knowledge and/or information; (2) problem solving information; (3) current or changing information; (4) projections; (5) comparative/evaluative information; and (6) political acumen.[12] Most leaders did not use the library heavily in their problem solving activity, and many did not expect to find in a public library the type of information they sought. This is a clear indication that in the perception of many citizen leaders the library is not a place to obtain the information needed to influence public policy decisions. The question emerges: In this information age, can libraries afford the image of providing only a fairly low level of information service, simply because they have not adequately learned about problem environments?

Why People Seek Information

Several researchers (notably, T. D. Wilson and Brenda Dervin) have come to believe that psychological factors may influence a person's motivation to seek information. Researchers are beginning to suggest that it would be fruitful for the field to gain knowledge of psychological and other forces, on the premise that people may not be driven totally by their surface desire to obtain information.[4,7] Dunn, influenced by this research, reported recently on the influence of psychological needs on information seeking of undergraduates.[13]

It may be too soon to determine how such knowledge can be integrated into information systems; however, Wilson believes that when researchers begin to think of information users as individuals motivated by a wide range of personal needs, there will likely be a shift away from the exclusive focus on information sources. The research frontier emerging from this broadened focus is likely to be multidisciplinary, including knowledge from psychology, sociology, and the field of communication. New research models will explore both the cultural and organizational contexts of information seeking, as well as information resources and information transfer mechanisms.[4]

New studies are already appearing which ask why people use information (i.e., what uses they make of it, how they make sense of it) and, similarly, why and how people use libraries. Dervin and her colleagues have done much of this work. Their aim has been to develop a framework for understanding users of information and libraries, based on knowledge from the discipline of communication. The Dervin sense-making model is labeled situation-gap-use: "The sense maker is stopped in a situation. Movement is prevented by some kind of gap. The sense maker is seen as potentially making some kind of use of whatever bridge is built across the 'gap' the user faces."[2,14,15,16]

The knowledge gained from this research has been used to look at the value of libraries to individuals and the use to which people put information. Methods have been refined since the first research was conducted in the early 1970s. MacMullin and Taylor believe that theory in this context can be seen as "a continuum which proceeds from question to problems to sense-making." They argue that "sense-making is not sufficiently understood at this time to be used in the design of information systems."[11] The concept, however, has enhanced our understanding of why people seek information.

The Interface Among Users, Libraries, and Librarians

Studies of the User

Researchers have come to approach library user studies cautiously. Librarian-practitioners often do not exercise the same caution. User studies are often more concerned with how the user interfaces with the library than with how the library meets user needs. At least a decade ago it was found that library use studies framed from the library's perspective, rather than that of the individual who needs information, tend to provide unrealistic data on users. In 1977, Zweizig and Dervin warned the library field that the "old model of user studies -- the identification of who uses the library and how much -- has been pushed as far as is helpful."[6]

Studies that focus on user needs have provided valuable information to libraries. User perceptions have come to be recognized as a major factor in information seeking behavior: for example, users may not be sure which questions are appropriately asked of librarians. Swope and Katzer[17] found that students were reluctant to ask library staff questions at all. Friedes[18] found that users "perceive reference service as intended for simple questions and quick replies," and that user expectations of libraries are low.

Research in academic libraries has shown that many library users have little contact with librarians; that those who do make little distinction between librarians and other library staff members; and that they show little preference about who answers their questions (quite an unusual client-professional relationship). This work suggests that most users are not true clients, their relationships being limited by present reference practice to isolated encounters, and that, ultimately, the library has a larger clientele than its librarians actually serve.[19] Research on the information needs of citizen groups, on the other hand, has shown that when librarians are considered part of a client's trusted interpersonal group of sources, the library is thought to be a valuable information resource.[12]

The purpose of the information profession is to increase access to knowledge and information which has been, until recently, housed primarily in the library. The failure to distinguish between the institution and those who practice in it has created barriers not only for library and information professionals, but also for their clientele. We speak of library users far more frequently than of the profession's clientele. The terminology suggests that the librarian is subservient to the building. To what extent are these generalizations true? If they do ring true, how are those who need information affected? Sociologists long ago doomed librarians to perpetual occupationhood. A more careful distinction between the professional and the institution might serve the dual purpose of increasing the status of the profession and increasing user access to information.

The Role of Librarians as Information Intermediaries

User misperceptions negatively affect the ability of librarians to meet information needs, simply because a profession cannot serve those who do not understand its purpose and expertise. Any system that is improperly understood cannot be used effectively. Librarians must actively seek to change user perceptions of the librarian's role in order to improve system delivery.

When researchers are critical of library service delivery patterns, it is not out of disdain for libraries, but with the aim of identifying areas where change is needed. It is within this context that this paper examines the information intermediary role of the reference librarian, a role that has evolved in the past 100 years without being fundamentally changed by the field's concern with responding more adequately to information needs.

The discussion of the user-library interface focuses on the relationship between the reference librarian and the library user, since this is the primary contact for most individuals who seek information in the library. Observations here are especially applicable to medium to large public and academic settings. Of course, there are other modes of interaction between librarians and users -- notably, client-centered roles in special libraries and in health science libraries -- but reference services remain fairly unaltered from earlier decades as the focal point of client contact in most libraries.

The question that should be asked of reference practice is: How does the way librarians respond to information requests affect their ability to meet information needs? This response can be examined by looking at the professional role that has been chosen. At least three disparate roles exist, and the divergence among them must be narrowed. First, there is the ideal role of the information intermediary who seeks to serve society: the librarian from the profession's vantage point. This role is often written about in platitudinous terms. Second, there is a perceived library intermediary role: the librarian as seen by library clientele, extracted from past experience and from common knowledge. Finally, there is the de facto role, which reflects present practice: this role is the basis for user interaction with librarians, and is likely to be the one transmitted to non-users.

The disparity among these three roles has been clarified by the work of Argyris and Schon,[20] who believe that individuals and professions are governed by two distinct, and often conflicting, motivations -- "espoused theories" and "theories-in-use":

> "When someone is asked how he would behave under certain circumstances, the answer he usually gives is his espoused theory of action for that situation. This is the theory of action to which he gives allegiance, and which, upon request, he communicates to others. However, the theory that actually governs his actions is his theory-in-use, which may or may not be compatible with his espoused theory; furthermore, the individual may or may not be aware of the incompatibility of the two theories" (Argyris and Schron quoted in Nauratil).[21]

The Ideal Intermediary Role: The Espoused Theory

Librarians have very high ideals for their profession. The profession's public statements address the field's espoused theories. The American Library Association, for example, speaks of "the broad social responsibilities" of the profession "in terms of the contribution that librarianship can make in ameliorating or solving the critical problems of society." Toward that end, the ALA seeks to ensure that "every individual has access to needed information at the time needed and in a format the individual can utilize," through the provision of library and information services carried out with "the highest level of personal integrity and competence."[22] Statements such as the ones above provide the basis for the ideal professional role. Because of the high sense of idealism of the profession, these statements tend to be lofty. However, they lack operational detail, and thus they tend to blur the distinction between the library and the librarian.

The Theory-In-Use and Its Impact on Information Seekers

Reference services in libraries have, for a century, served primarily to explain a bibliographic apparatus, help users find library materials, and increase access to the information within the library. Has the time come to re-invent reference service so that it is more responsive to user needs? Researchers have begun to question the design of traditional reference service and the messages it sends to library users.[18,19,23,24] The present model, developed when libraries were far more concerned with materials than with people, suffers from a lack of user orientation.

The de facto professional model of reference service is based on a number of "theories-in-use." It is characterized most often by an open desk located somewhere in a large room in the library. Information seekers usually approach an anonymous staff member of unknown credentials who is seated behind the desk and who may be simultaneously engaged in some other activity. Since the staff members rotate days and times, the information seeker may need to initiate contact anew upon each return to the reference desk.[19]

Librarians often question their relatively low status as professionals. Over a quarter of a century ago, William Goode reported that the public's perception of librarians as clerks posed a serious problem for librarianship as it sought professional status.[25] We are now beginning to realize that the professional model in current use not only lowers the status of librarians but also interferes with the ability of users to secure needed information.[18,19,23,26,27,28]

Even though information needs research has repeatedly revealed a preference for oral channels, library managers continue to use a design that downplays meaningful interpersonal interactions between librarians and information seekers. Thelma Friedes[18] suggests that the reference desk arrangement "conveys an implicit promise never to let the reader go unserved, but it also pegs the service at a low level." Patrick Wilson[29] charges that the present model is both superficial and nonprofessional:

> ". . . superficial because it is based where possible on quotation from reference works and limited to small matters of 'fact,' nonprofessional because it is not based on any individual assumption of responsibility for the quality of the information given."

Unfortunately, by making the reference desk "the focal point of reader assistance," libraries not only "expend professional time on trivial tasks" but also "encourage the assumption that the low-level, undemanding type of question handled most easily and naturally at the desk is the service norm."[18]

It is generally assumed among practitioners that the "why" question is not appropriate in this profession. Journalists and psychologists are free to ask it, but librarians have always drawn the line at wanting to know why someone might need information, fearing invasion of user privacy: ". . . librarians should never ask why the client-patron wants the information requested" (Jahoda and Braunagle, quoted by Wilson[30]). Wilson argues:

> ". . . without information about purpose, there is no basis for judgment about need, nor any good way of discovering 'real' wants. Without such information, all one can do is take requests at face value."[30]

Wilson believes that by taking requests at face value (i.e., negotiating only the question and not determining why it has been asked), librarians may be limiting their ability to meet information needs. He argues that by accepting an old rule that it is not appropriate to ask the user why information is needed, librarians declare that they are not responsible either for the effective use of information sources or for the information in those sources.[30]

In short, it appears that a number of the present "theories-in-use" in reference do not enhance the role of the librarian as intermediary and, further, act as a barrier to user access. Research must be conducted into the effectiveness of the present model, and the extent to which it is actually impeding interaction.

Librarians must determine the effect of blurring the distinction between the library (where the professional activity occurs) and the librarian (who provides the interpersonal expertise) on the user's ability to obtain information. Researchers need to find out how much the "theories-in-use" limit meaningful interpersonal contact and discourage a true client-professional relationship.[19,24,28]

Actions by Librarians Which Result in Better Knowledge of User Needs and a Clearer Message to Information Seekers

Reference is not the only service in libraries. Progress has been made toward making libraries client-centered institutions. All types of libraries have recently taken action to factor the user into service design. Academic libraries, for example, are making far more careful distinctions among clienteles than just giving faculty longer book loan periods. Distinctions have been made among faculty (who have teaching and research needs), graduate students (who are learning how knowledge grows in their field), and undergraduate students (who need help understanding major resources). Although they do not yet respond as well as they will in coming decades, librarians have made progress toward responding to varying information needs. Library services tailored to a specific clientele are not typically based on the research knowledge of the clientele. They are often not even based on adequate needs assessments, but on educated guesses built on experience working with a specific group of users. Faculty loads for librarians, an excellent method increasing knowledge of information needs, have been proposed.[31]

Librarians who provide bibliographic instruction also respond to specific needs of users, however imperfectly those needs are understood. Although such instruction has been provided in all types of libraries, it is primarily confined to academic and school libraries. In order for biblographic instruction programs to succeed, librarians must learn about the specific information needs and characteristics of well-defined user groups.[32] Specialized instruction programs, such as assistance with term papers, provide the instructor with increased knowledge of the specific needs (and capabilities) of students who seek help through these programs.[33]

Well-focused services that require contact between a librarian and a client group within the context of a problem environment are likely to change the public's perception of the librarian as information specialist. Such services move the librarian beyond answering the isolated reference question and into the role of a professional visibly helping the client solve problems. Role-expanding services, such as selected dissemination of information -- services built on individual users' specific profiles -- have been provided by special librarians for some time. Selected dissemination of information is only one of a number of special library services that result in intense, sustained, and meaningful contact between the librarian/information specialist and the client, and which increase the professional's ability to respond to information needs.

Health science librarians, in the user-oriented tradition of special librarianship, have devised a variety of services that increase meaningful contact with their clientele of physicians, nurses and allied health professionals, researchers, and patients. Of special interest in a discussion of services modeled on user information needs are the clinical medical librarian programs operating in a number of hospitals. These programs involve a medical librarian who serves as the information specialist with a clinical team.[34,35] In serving on this team, the clinical librarian may go on rounds with the clinical staff, attend clinical meetings at which patient care is discussed, and otherwise participate directly in patient care. The clinical librarian thus identifies information needs from participating directly in the problem solving activity rather than learning second hand about the information needed.

Experience with clinical medical librarian programs over time has shown that closer contact with the problem environment puts the librarian in a much better position to provide information that is actually needed. The programs provide an effective means for information exchange between the library and the medical staff, and ready assessment of the material provided relative to what is actually needed. As a result, the clinical librarian is able to provide guidance to other members of the team as to how the library can best serve them.

Public libraries, much more than any other type of library, serve a diverse clientele. At first glance, the knowledge gained from information needs research may not appear to be directly relevant to public library practice, but its application to the evolution of public library service philosophy is as necessary as it is for any other type of library. The public's popular reading needs can be anticipated, but its information needs are not as easy to predict. The public librarian should understand not only the context of a user's need for information, but also something of the user's beliefs, perceptions, and other driving forces.

The Public Library Association has attempted to move public libraries toward user-oriented services, but as yet the Association's planning documents are not adequately driven by the information needs concept. Still, the examination of public library roles is a move in the right direction.[36,37] Research most likely to move public libraries toward a greater ability to respond to specific information needs will include specialized studies focusing on problem environments.

Monroe is among a small group of writers who have advocated for several decades that public library service be client-centered.[38,39,40,41] A variety of articles and studies began to emerge during the era of federal funding, most often as a result of that support. Those studies, written both by library educators and by librarians, examined the conditions that limit an individual's ability to function in society and the characteristics that set groups of people apart from others. They showed how societal conditions and individual characteristics (economic disadvantage, age, physical or mental handicap, language, illiteracy, imprisonment, etc.) influence the ability of certain categories of people to use libraries and obtain information. (For examples, see Lyman,[42,43] Turock,[44] Monroe,[38] Casey,[45] Wittenberg and Thresher,[46] and Nauratil.[20]) This literature provides insights for librarians and has helped to break down the myth of undifferentiated service to "the public," which so severely limits the ability of public librarians to meet information needs for any group. Much of this literature speaks of the collaborative nature of seeking to meet special needs, working closely with the client and with professionals in other fields.[38]

In spite of this work, however, the public library's commitment to its traditional clientele far outweighs its concern with meeting identified information needs. Nevertheless, innovators, often with federal support and increasingly through foundation support, are continuing to develop client-centered services.[47] These services reflect the shift from simple question answering to problem solving, which results in a stronger client-professional relationship. Carr seems to marvel at the new relationship that developed between librarians and their clients during the Adult Independent Learning Project:

> "What we are talking about is going beyond the giving of information -- to evaluate and sort it, to help in its integration with existing information, to communicate about it, and so to create better conditions for individual knowing. Such a difference means that the librarian moves from witness to participant, from distance to proximity, from information to communication and beyond, to responsibility, identification, and instrumentality. Certainly proximity to the learner must mean that the librarian must be prepared to give up the barriers and masks that may have been too useful for too long."[48]

Public library services like the Adult Independent Learning Project, designed for a specific clientele, were often identified as outreach services, and were made possible during the late 1960s and 1970s by federal dollars. Many of the federally funded services were aimed at the disadvantaged, since library use studies have always shown that public libraries serve the middle-class, educated, reading public. During this period, client-oriented services became at least temporarily fashionable in many public libraries, and the programs helped to chip away at the perception that public libraries serve the (undifferentiated) public. The client-oriented outreach services waned with federal funding reductions, however, and many librarians "who jumped on the bandwagon jumped back off as soon as they found they had to pay their own fare."[20]

In the 1980s, innovative services designed to meet specific needs have been boosted by foundation funding. For example, job and educational information centers, such as those funded by the Kellogg Foundation, first in New York and now in eight other states, are designed for sustained client contact and referral. Studies of educational information centers have shown that in the process of overcoming a range of educational deficiencies -- obtaining a general education degree, identifying college courses to provide needed job skills, or, more basically, discovering the type of occupation to which a person is best suited -- those who seek and find help in solving problems at the center go on to become clients.[49]

Researchers need to study the common elements in these attempts at providing client-centered service. How do they differ from the reference model in the climate created for user interaction? How effective are they in creating an environment for meeting information needs? How can these services better integrate the results of research on information needs? How effective are the collaborative elements of these services? How much more effective are librarians who work closely with specific problem environments at meeting information needs? How far can the role of the librarian be stretched?

Meeting Information Needs in the 1990s

Technology and Information Needs

The revolution in the way information is stored and retrieved has had such an enormous impact that it cannot be ignored here. It has been estimated that by 1990, 90% of U.S. workers will have access to computers.[50] These figures can be repeated for a variety of occupations. Computers, of course, are not confined to the workplace. Savvy information seekers have long used the telephone to increase their access to information in libraries. Now, with a computer and a telephone, individuals can check commercial databases, library bibliographic records, and information databases, and request that materials be delivered to their desks, all without leaving their home or office. Marilyn Gell Mason[50] predicts that by 1995 over half of library service will be provided to users who have not entered a library building. When people take advantage of telephone and computer access to the information in libraries, physical barriers are broken down. Users access information directly and, in the process, bypass the information intermediary. What are the implications of these developments for meeting information needs?

Other problems arise in meeting information needs in an electronic age. Availability of information is likely to be decreased for those who lack electronic access. In this decade, information in electronic form has begun to replace print information. How does this phenomenon affect librarians who seek to meet information needs that can be satisfied only though electronic form? In addition, the rich store of information provided by librarians has contributed to information overload that actually interferes with gaining access to information:

> "The danger of overload is not only that people are receiving a lot of messages that are of no value to them; it is also that the individual may, in frustration with too much information -- even intrinsically useful and valuable information -- resort to rejection of the messages, perceiving them as noise."[51]

What can the information profession do to manage information overload and increase the ability of users to obtain the information they need?

Societal Concerns

Libraries are operating now in an information society. A few of the changes that directly affect the way libraries attempt to meet information needs include the following:

- Information is more readily available directly to individuals.
- Likewise, a number of competing educational and information resources stand ready to meet information demands, most often for a fee.
- Demographic shifts have occurred, and the largest population group has been socialized in the television era.
- Functional illiteracy is increasing to the extent that a skill shortage is expected by the year 2000.
- Societal upheavals in other countries have resulted in increasing numbers of Americans who speak and write English very poorly, if at all.

Generalizations such as these about the people of this nation have an effect on the ways in which libraries must function in order to meet the information needs of current and potential users. Librarians need to be aware of societal trends in order to anticipate their effects on library service.

Research Agenda for the 1990s

The challenge of the 1990s is to design research that will help librarians, and the information systems they work with, anticipate a wide range of information needs. The goal of truly meeting information needs is still elusive for most situations, but research in the past decade has resulted in a better knowledge base and a more thorough understanding of information needs. Likewise, more individuals at the practice end of the profession have become aware that services should be based on information needs.

The research agenda is extensive, and the research suggested here is in no way exhaustive. Rather, it is an indication of the range of research needed for more responsive library and information services in the information age.

There must be continued research into information needs through learning more about problem environments. As this research is undertaken from the public library perspective (which has historically had difficulty focusing on specific information needs), priorities must be set as to the most urgent sets of needs. The public library, for example, has paid only lip service to its role in developing "an informed citizenry." Since no other institution meets this need for the adult population, it is a high priority. In a changing society, increasing numbers of individuals are seeking information about new employment situations and the educational opportunities needed to change their employment. No single institution meets this need. Examination of problem environments is required, of course, outside the context of specific types of libraries. Continued research into problem environments must occur as the profession broadens the environments in which information specialists work.

Research must be undertaken that will lead the profession to additional theoretical models. Promising investigations into the psychological and social factors that influence information needs should be continued. Efforts to understand the uses that people make of information should be continued. There should also be continued research into the interaction between the information seeker and the source, and into factors that influence that interaction; the aim here should be to make resources more responsive to the information seeker. Interdisciplinary research is needed to improve information systems, especially research drawing from the behavioral sciences. There must be further examination of the effects of societal trends and technological changes on future information needs.

Research to identify and evaluate successful components of problem-oriented information services should be designed, with the aim of developing services based on these models. Team studies involving both researchers and librarians should be undertaken to integrate research knowledge into client-centered services and to increase the responsiveness of libraries to users.

Continued examination of the weaknesses of the present reference model, which result in reduced access to needed information, is required. With the same aim in mind, the impact of user perceptions of the information intermediary capabilities of librarians needs to be studied further; methods need to be developed to overcome negative or inaccurate user perceptions, which limit the types of questions and problems people are willing to bring to libraries. Research is required to identify and examine the effects of "theories-in-use" that work to reduce the ability of librarians to meet information needs. Likewise, research should be continued into methods of helping librarians abandon less productive information practices and develop services responsive to user needs.

Considerable thought must be given to the nature of library and information science education, to increase both the ability of librarians to meet information needs and the ability of schools to prepare students for an understanding of the wider variety of information problem environments. Finally, as technological education begins to permeate the Masters curriculum at library schools, research is needed that will allow our knowledge of information needs to be integrated into the curriculum as well.

Bibliography

1. National Commission on Libraries and Information Science. Library and Information Needs of the Nation. Washington, D.C.: U.S. Government Printing Office, 1974.

2. Dervin, B., and Nilan, M. "Information needs and uses," in Annual Review of Information Science and Technology.
1-33. White Plans, New York: Knowledge Industry Publications, 1986.

3. Chen, C. C. and Hernon, P. Information Seeking: Assessing and Anticipating User Needs. New York: Neal-Schuman Publishers, 1982.

4. Wilson, T. D. "On user studies and information needs," Journal of Documentation 37(March) 1981, 3-15.

5. Mick, C. K., Lindsey, G. N., and Callahan, D. "Toward usable user studies," Journal of the American Society for Information Science 31(September) 1980, 347-356.

6. Zweizig, D., and Dervin, B. "Public library use, users, uses: Advances in knowledge of the characteristics and needs of the adult clientele of American public libraries," Advances in Librarianship 1977, 231-255.

7. Wilson, T. D. "The cognitive approach to information seeking behavior and information use." Social Science Information Studies 4(2/3) 1984, 197-204.

8. Krikelas, J. "Information-seeking behaviour: Patterns and concepts," Drexel Library Quarterly 19(Spring) 1983, 5-20.

9. Parker, E. "Information and society," in Annual Review of Information Science and Technology, 345-373. White Plains, New York: Knowledge Industry Publications, 1973.

10. Parker, E., and Paisley, W. Patterns of Adult Information Seeking. Stanford, California: Stanford University Press, 1966.

11. MacMullin, S. E., and Taylor, R. S. "Problem dimensions and information traits," The Information Society 3 1984, 91-111.

12. Durrance, J. C. Armed for Action: Library Response to Citizen Information Needs. New York: Neal-Schuman Publishers, 1984.

13. Dunn, K. "Psychological needs and source linkages in undergraduate information-seeking behavior," College and Research Libraries 47(September) 1986, 475-481.

14. Dervin, B. "Useful theory for librarianship: Communication, not information," Drexel Library Quarterly 13(July) 1977, 16-32.

15. Dervin, B. "An overview of sense-making: Concepts, methods, and results to date." Paper presented at the International Communication Association Annual Meeting, May 1983, Dallas, Texas. Available from Brenda Dervin, Department of Communication, Ohio State University, Columbus, Ohio 43210.

16. Dervin, B., and Dewdney, P. "Neutral questioning: A new approach to the reference interview," RQ 25(Summer) 1986, 506-513.

17. Swope, M. J., and Katzer, J. "Why don't they ask questions?: The silent majority," RQ 12(Winter) 1982, 161-166.

18. Friedes, T. "Current trends in academic libraries," Library Trends 31(Winter) 1983, 457-474.

19. Durrance, J. C. "The influence of reference practices on the client-librarian relationship," College and Research Libraries 47(January) 1986, 57-67.

20. Argyris, C., and Schon, D. A. Theory in Practice: Increasing Professional Effectiveness. San Francisco, California: Jossey-Bass, 1974.

21. Nauratil, M. J. Public Libraries and Nontraditional Clienteles: The Politics of Special Services. Westport, Connecticut: Greenwood Press, 1985.

22. American Library Association. Handbook of Organization, 1986-87. Chicago: American Library Association, 1986.

23. Ford, B. J. "Reference beyond (and without) the reference desk," College and Research Libraries 47(September) 1986, 491-494.

24. Lynch, M. J. "Reference interviews in public libraries," Library Quarterly 48(April) 1978, 119-142.

25. Goode, W. J. "The librarian: From occupation to profession?" Library Quarterly 31(October) 1961.

26. Durrance, J. C. "The generic librarian: Anonymity versus accountability," RQ 22(Spring) 1983, 278-283.

27. Mathison, N. "The academic library nexus," College and Research Libraries May 1984, 207-213.

28. Nielsen, B. "Teacher or intermediary: Alternative progressive models in the information age," College and Research Libraries 43(May) 1982, 183-191.

29. Wilson, P. Public Knowledge, Private Ignorance: Toward a Library and Information Policy. Westport, Connecticut: Greenwood Press, 1977.

30. Wilson, P. "The face value rule in reference work," RQ 25(Summer) 1986, 468-475.

31. Boyer, C. "Guest editorial," College and Research Libraries 47(6) 1986, 533-534.

32. Bechtel, J. "Conversation: A new paradigm for librarianship?" College and Research Libraries 47(3) 1986, 219-224.

33. Kohl, D. F. "Effectiveness of course-integrated bibliographic instruction in improving coursework," RQ 27(2) 1986, 206-211.

34. Barbour, G. L. "Morning report: Role of the clinical librarian," Journal of the American Medical Association 255(14) 1986, 1921-1922.

35. Cimpl, K. "Clinical medical librarianship: A review of the literature," Bulletin of Medical Library Associates 73(1) 1985, 21-28.

36. McClure, C. R., et al. Planning and Role Setting for Public Libraries. Chicago: American Library Association, 1987.

37. Van House, N. A., et al. Output Measures for Public Libraries. Chicago: American Library Association, 1987.

38. Monroe, M. E. "Community development as a mode of community analysis," Library Trends 25(January) 19 76, 497-514.

39. Monroe, M. E. Library Adult Education: The Biography of an Idea. New York: Scarecrow Press, 1963.

40. Monroe, M. E. "Education in librarianship for serving the disadvantaged," Library Trends 20(October) 1971 445-462.

41. Schlachter, G. A., ed. The Service Imperative for Libraries: Essays in Honor of Margaret E. Monroe. Littleton, Colorado: Libraries Unlimited, 1982.

42. Lyman, H. H. Library Materials in Service to the Adult New Reader. Chicago: American Library Association, 1973.

43. Lyman, H. H. *Reading and the Adult New Reader*. Chicago: American Library Association, 1976.

44. Turock, B. J. *Serving the Older Adult: A Guide to Library Programs and Information Sources*. New York: R. R. Bowker, 1982.

45. Casey, G. *Library Services for the Aged*. Hamden, Connecticut: Shoe String Press, 1983.

46. Wittenberg, C., and Thresher, J. *WEBS: A Career and Educational Counseling Service*. New York: Cornell University, 1985

47. Weingand, D. E., ed. "Adult education, literacy, and libraries," *Library Trends* Fall 1986.

48. Carr, D. "The Meanings of the Adult Independent Library Learning Project," *Library Trends* Fall 1986, 327-345,

49. Jacobson, M. D. *New York State Education Information Centers Program*. Albany, New York: The State Education Department, 1984.

50. Mason, M. Gell. "The Future of the public library," *Library Journal* September 1985, 136-140.

51. Asheim, L. "Ortega revisited," *Library Quarterly* 52(July) 1982, 215-226.

Comments by Reviewers

The three reviewers who commented on this article addressed the issues of the cost of assessing user needs and the methodologies that could be employed to identify user needs. They also proposed alternative approaches to the topic area and additional research objectives.

Costs of User Need Assessment

The economic forces that drive each type of library and shape their strategies for addressing information needs should be analyzed. It would be useful to explore how mission, funding, and performance are linked; to develop criteria for determining the cost-effectiveness of information services; and to discuss variations in the relationship between cost and performance by type of library and type of clientele. In addition, the costs of addressing needs by various techniques (such as a behavioral approach vs. referring question to other institutions) should be compared.

Research is also needed to help public libraries identify the information needs of their clients and establish priorities in addressing those needs. Such research could also establish guidelines for allocating scarce and expensive resources (such as the time of a reference librarian).

Methodologies for Identifying Information Needs

An inventory of information providers would be helpful, as it would distinguish between academic, special, public and school librarians. The information could be further refined to position these groups in their respective markets, alongside other private and public sector information providers.

Clearer definitions are needed within this area of study: quantitative definitions of levels of service would define which resources might best meet an information need, and a qualitative definition of outputs would measure such factors as user satisfaction, accuracy, and turnaround time (and their importance in meeting the information need).

User research dating back to the 1950s, 1960s, and 1970s should be incorporated into our current thinking and understanding of the user and the model of user service that we have. The implications of past research findings should be analyzed. The following articles are suggested for further reading:

- Vis-a-vis the nature of the reference interaction, there are two additional reports that shed light on this issue: Anita Schiller's 1965 Library Quarterly article and Thomas Eichman's late 1970s RQ article.

- Also recommended are Library and Information Service Needs of the Nation and Patrick Penland's article in the Summer 1961 issue of Adult Education.

Durrance mentions that people may take the path of least resistance in conducting searches. There is in fact empirical support for a subtler form of this idea. Research has indicated that people would consciously reject information sources that they knew to be of high quality for sources that they knew to be of low quality but easier to use. Now we have truly fast and easy to use automated information systems, and we need to complete our understanding of information seeking behavior in order to design adequate systems. For example, more extensive research is needed to investigate multiple linkages in bibliographic instruction.

Additional Research Objectives

- How can new technology enhance or hinder the satisfaction of information needs?

- What public policy issues should be addressed before and after considering costs, technology, information delivery choices, and training?

THE ROLE OF THE PUBLIC SERVICES LIBRARIAN: THE NEW REVOLUTION

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Abstract

Technological advances are changing the way libraries manage common tasks and the way librarians serve their patrons. Reference service today has its roots in the 19th-century movement to institutionalize charity and has for decades provided the field with a model of professionalism committed to extensive, individualized help. The computer age has expanded the role of the public services librarian. Library users expect more assistance in using unfamiliar systems, creating a demand for reference librarian to become proficient in a widening variety of computer-based systems. As a result, new models of service delivery are needed. Two specific directions are being taken toward redefining the service model. First is an effort to devote more resources to training library users, a movement that has developed over the past decade. Second, information systems are being developed to serve library users without requiring the mediation of a librarian. To stimulate further progress in these two directions, libraries should invest in the training of public services librarians, as well as technology research and development, so that a most valuable resource -- the good will of library users -- will be preserved.

Introduction

Emerging new roles for public services librarians, brought on by rapid advances in information technologies, may lead to important changes in the ways people use libraries in the future. Traditionally, public services librarianship has been thought of primarily in terms of reference service, and secondarily in terms of professional efforts devoted to developing public programs for cultural enrichment, especially in American public libraries. In academic libraries, the common division of professional positions between public services and technical services has often placed all library functions involving direct personal contact with users (such as circulation, photocopying service, and special collection service) under the umbrella of public services. In this essay, however, consideration is given only to those services typically offered by reference librarians in all types of libraries: answering questions, performing literature searches, teaching the use of the library and of bibliographic tools, and providing advisory services to readers.

In the decade of the 1970s, a revolution occurred behind the scenes in American libraries with the advent of massive computing networks designed to support libraries' most labor-intensive operations: the acquisition, cataloging, and related processing of books and other materials. The transformation of work routines, equipment use, and job responsibilities for all levels of staff was enormous, resulting in the creation of what are now seen as the solid cornerstones for the future "national bibliographic database" -- computing utilities that can be used to locate virtually any recent book or periodical in any library in the country. That achievement was crowned in the first years of the 1980s with the online catalog, an innovation that provided the public its first inkling of the radical change the computer was bringing to libraries of all sizes. The move of the computer terminal from the back office to the public area of the library signaled not only the triumph of computing in the catalog department, but also the first volley in a new revolution at the reference and public services desk. That revolution is likely to bring fundamental change in the services offered by libraries and in the way such services are delivered.

Technological, economic, historical, and ideological forces are reshaping the ways in which librarians provide assistance to users. Significant research findings have contributed to our understanding of library public service up to now, and new lines of research advancing both inside and outside librarianship are likely to shape the outcome of this second revolution in library service. Theoretical and empirical work in the sociology of occupations offers new insights into reference work, especially in considering the areas of service that librarians value most and the possibilities for change in public service roles. Research in cognitive science (a new discipline combining elements of psychology, linguistics, computer science, and artificial intelligence) is germane to longstanding questions in library reference work. Values held within the community of librarians and values significant to society as a whole are also critically important in shaping the ongoing revolution in information delivery. Awareness of these developments is essential for understanding developments in public services librarianship and for setting priorities for future research in this area.

In conjunction with the new revolution in library services, the role of the public services librarian may well be recast in terms of a new model that takes into account sophisticated information technologies. Such a new role will likely be defined as much by research and development in computing and related technologies in and beyond libraries as by purposive redefinition within the field of librarianship itself, although articulation of values central to library public services will also be critical as new technologies are introduced. Forging a new model that can best serve the needs of those who use libraries requires careful evaluation of the relative success of past models, based on relevant research both within and beyond librarianship, as well as an understanding of the basic social values which libraries are intended to fulfill.

Defining what actually constitutes service delivery is a central issue in the radical change the field is facing. For most librarians currently working in the field, the public services librarian is most closely identified with traditional reference service: answering questions posed by users at a service desk in a prominent public area of a library, usually near the library's catalog and collection of indexes, directories, and related tools. However, more librarians today than in the recent past are coming to identify public services as including another key service: instructing users on how to use the library and the many information tools it contains. How these two ideas compete as priorities for working librarians is important to the future direction of the field. And, in addition to these two notions of service, a third now seems barely visible on the horizon, though moving rapidly closer: public services librarians may provide expertise contributing to the design, installation, and use of new information technologies in and beyond libraries.

The definition of public services librarianship is tied to the larger issue of how librarianship in general defines itself as an occupation in the public eye. As the new information products being introduced with astonishing rapidity find enthusiastic users, the traditional service model may become more and more untenable. Forging a new public service model consistent with new technological conditions is a key goal for the revolution in service now underway, and offers a useful research agenda for the future.

Traditional Reference Services and the Professionalization of Librarianship

The traditional, question-answering model of public service, still widely accepted as a guide for library practice in this country and still taught in library schools, is closely tied to librarianship's professionalization movement. Limitations of the traditional model can be better understood through the perspectives provided by recent work in sociology and cognitive science than through the research approach associated with librarianship, which is committed to a particular service model. As Michael Harris has recently suggested,[1] the often parochial research approach of librarianship can blind the field to important factors; while traditional reference services provide valuable assistance to many library patrons, their function in molding a particular public impression of librarianship in general can better be understood through a sociological interpretation of the occupation.

The classical model of public services librarianship has its roots in the 19th-century movement to institutionalize charity.[2] Many of the elements that defined the specialization then are still with us, and are still taught in library schools. Samuel Swett Green's classic address to the organizing conference of the American Library Association in 1876[3] provided what remains a fairly complete inventory of the librarian's responsibilities in relation to library users: to develop and utilize special skills for answering users' questions; to provide personal assistance to users as they search for literature on their own; to retrieve materials for users in certain situations; and to offer instruction to users, enabling them to become more self-reliant. Green did not, however, suggest a division of labor in which certain librarians took on these responsibilities as specialists in public service. This specialty area, which is well established today, was defined by Melvil Dewey at Columbia,[4] Charles McCarthy at the Wisconsin Legislative Reference Department,[5] and others.

It is important to recognize that how librarianship has defined in specific detail those tasks appropriate to providing user services affects not only the range and variety of services provided but also, in a reflexive way, how librarianship defines itself in the public eye. Commentators from Flexner[6] on have established the service ideal as the mark of a profession. Specification of the role of the public services librarian occurs not only in the objective determination of general needs that library users may have for services, but also in a subjective assessment of how librarianship wishes to be perceived.

Sociologists Rue Bucher and Anselm Strauss have provided a framework useful for understanding the circumstances in which an occupational specialization defines itself.[7] Bucher and Strauss observed that members of professional occupations, though they perform many tasks, include a subset of members who perform "core tasks" -- tasks that offer the general public a particular and favorable image of the occupation as a whole. For the physician, the core task is the sympathetic bedside visitation. For the lawyer, it is the valiant courtroom argument on behalf of the wrongly accused defendant. And for the librarian, it is the knowledgeable and helpful reference activity which, above all tasks performed within the field as a whole, forms within the public mind a positive image of librarianship. This "core task" nature of traditional reference work has led the field of librarianship to be insufficiently critical of the traditional model of the public services librarian.

This observation in no way devalues the performance of question-answering itself. Rather, it is presented in order to show how research on public services has for too long been restricted because of researchers' overvaluation of the model of service, and their consequent failure to consider alternative models objectively. There is no question that the availability of expert staff to help users gain access to library collections is a very important and valued resource. Literally hundreds of user studies in all types of libraries demonstrate the necessity of user assistance,[8] and even the most casual survey of library users can demonstrate conclusively how grateful they are for the availability of needed help.

In addition to contributing the notion of core tasks to the study of occupations, Bucher and Strauss have noted that professional schools play an important role in the professionalization of many occupations. Since the 1930s, both the theoretical work and the setting of a research agenda for library public services have occurred in library schools. Because the schools have an interest in promoting the status of librarianship as a profession, they have defined the research agenda for public services without questioning the traditional model itself. The core task nature of traditional reference has been a powerful governor of much of the research agenda, unduly limiting the range of problems posed by question-answering and other public services activities.

The theory that has dominated public services research in terms of a particular service model was developed in library schools. A major organizing principle for describing the alternatives available to librarians in offering service to the public was first defined by James Wyer in his 1930 textbook, Reference Work.[9] Wyer proposed a typology of "conservative," "moderate," and "liberal" service to characterize policy alternatives for library managers. That typology, though modified in its language by subsequent writers (an influential article by Samuel Rothstein[10] used the terms "minimum," "middling," and "maximum"), was commonly taught in American library schools well into the 1970s.

Although Wyer's typology was putatively descriptive, in fact it provided a normative theory which held sway until quite recently. It offered as an ideal the provision of service by librarians acting as intermediaries between users and library collections. Because the theory assumed that one could generalize about the level of service offered by a library -- without defining how "level" might be measured -- there was scant basis upon which to build research, other than to observe that variation in service level appeared to correlate with the type of library (public, academic, or special) in which reference service was offered. The ideal, or model, for public services librarianship was the special library, where reference librarians provided tailored literature searches, offered literature alert services, researched user questions at length, and in other ways took on a strong mediating role between the library's collection and its users. Academic and school libraries, in which few such services were offered, were considered relatively non-service-oriented.

Subsequent research (e.g., Lawson[11]) tended to confirm this high-mediation bias, without seriously examining the limitations under which other types of libraries operated. More general theoretical perspectives dealing with service delivery in organizations, such as the work of William Rosengren on the concept of client membership in organizations,[12] has, unfortunately, not yet found a place in reference research.

At its extreme, the service typology theory portrayed the ideal role of the public services librarian as not merely assisting users in retrieving literature pertinent to their information needs, but actually providing information that would directly satisfy their needs. Such a service formulation in fact places the librarian intermediary in the powerful position of determining the nature of the information need, and places the client in a dependent position. Robert Wagers' essay "American Reference Theory and the Information Dogma" offers an excellent analysis of how the "levels of service" theory has hampered research and development on appropriate job design for public services librarianship, as well as providing with the "information dogma" phrase a pithy evaluation of the theory that has dominated this area.[13]

Among the practical problems facing librarians trying to develop services that reflect the high-level service model have been two especially serious ones with wide-ranging consequences. First, with a normative standard calling for a high degree of mediation, how are limits to be set when demand for information service outstrips available resources to supply it? Robbins[14] drew upon the work of the political scientist Michael Lipsky in observing how reference librarians behave as "street-level bureaucrats," developing ad hoc operational rules to permit the rationing of services when the formal organizational rules do not recognize the necessity to do so. The second problem, that clients are seldom aware of the services available to them, may be seen as a result of a service philosophy that has placed all responsibility for the specification of needs in the hands of professionals, though researchers and practitioners have typically not used this analysis in attacking the problem.

Users and Their Needs

Lancaster[15] has reviewed the considerable evidence documenting the low use of reference services in comparison to the number of people who routinely seek information or use libraries in other ways. An often-cited speculative article on this topic[16] asks in its title, "Why don't they ask questions?" However, the article fails to offer an analysis of how reference service developed historically as an activity meeting the internal concerns of an occupation that aspires to professionalism, as well as the presumed needs of library users. Is it really any wonder that American libraries, designed with open stacks and public catalogs in fairly standard formats to foster self-service, are not widely perceived as offering personalized help via intermediaries?

Fortunately, other social sciences have shown a growing interest in the relationship between service organizations and their clients. Though librarianship has tended to regard its research and development problems as unique and specific to the organizational context of libraries, in fact many of the problems are not specific, and are of some interest to social scientists not connected with librarianship. Indeed, by adopting a more generalized perspective, librarianship may gain a deeper understanding of the barriers to providing service, and may thus be stimulated to experiment with new approaches to service design. New Directions in Helping,[17] a recently published collection of papers, mostly by psychologists, provides a number of potentially valuable theories about help-seeking behavior. Research in the area of public services librarianship may well benefit from investigations centered on such topics as the person who could benefit from assistance but is unaware of the help that is available, the person who does not articulate the nature of his or her need when asking for assistance, the person who consciously avoids asking for assistance, and innovations in other applied disciplines designed to ameliorate such situations.

Promise Versus Product Within the Traditional Model

The dictum of "maximum service" values the quality of service provided in terms of its informational accuracy. A research formula currently in vogue addresses directly the issue of accuracy with findings that have been both fairly consistent across studies and distressing to many. Studies by Crowley and Childers[18] in the late 1960s found through unobtrusive measurement techniques that answers to factual questions provided by public libraries were on average correct only 55% of the time. More recently, Meyers and Jirjees[19] and Hernon and McClure[20] have applied and modified the Crowley and Childers methodology to assess accuracy rates within academic library reference departments, with similarly distressing results. Considerable debate on methodological and ethical issues raised by the unobtrusive measurement methodology has arisen in the field, but the bottom line of the accuracy problem remains unaffected. A more potent critique of this research formula lies in challenging the underlying assumption of the studies (and of the field, it must be added) that the primary duty of the public services librarian is to answer factual questions posed by users -- i.e., to provide maximum service. This point was raised by a number of participants in a recently published symposium.[21]

That the Crowley and Childers results, widely known in the field and among library school educators, could be replicated more than a decade later in other contexts would seem to indicate that either (1) the accuracy problem is not easily soluble by modification of the training or the work patterns of reference librarians, or (2) the significance of the accuracy problem is of less concern to practitioners than to those researchers who have pursued its measurement. If the first alternative is correct, the maximum service model may require substantial modification in providing a guide to service design, reflecting realistic criteria for performance evaluation rather than criteria that cannot be met. If practitioners are not overly concerned about the accuracy issue, dialog must be opened up between practitioners and researchers which acknowledges their different value positions and explores opportunities for coming to consensus on appropriate service goals and criteria for measuring their achievement. Neither alternative suggests that the field should not be concerned about the accuracy problem, for to do so would clearly be an abdication of responsibility for serving the public; however, admonitions to try harder do not seem likely to solve the problem. Rethinking of basic premises is in order.

The user demand and accuracy issues are but two of a number of challenges that have faced public services librarianship in recent years. Indeed, with the advance of general management techniques applied to libraries, considerable growth in the variety of resources (computerized and otherwise) with which reference librarians must be familiar, and greater sophistication in library science research, several commentators and researchers have remarked on the ferment in reference librarianship and its impact on practitioners. Miller[22] and Bunge[23] have pointed particularly to the problem of professional burnout which reference librarians may experience in many settings where increasing management demands for new programs, the introduction of new technologies, and the necessity of learning to use new tools have taken their toll on the service provider in the trenches. One could argue that such burnout is another consequence of the information dogma: with a theory of service that advocates providing essentially limitless assistance, the practitioner may have difficulty satisfying demands that are beyond human capacity.

The Impact of Online Bibliographic Searching

The technology of online bibliographic searching, which appeared on the scene in 1972, added to the pressures felt by public services librarians in living up to the maximum service ideal. Using remotely located computers to search databases of familiar abstracting services seemed to promise the realization of a dream: making maximum service an everyday affair. Providing customized bibliographies for users had long been a highly regarded practice, but only in libraries enjoying great wealth in staff resources. The new technology made the preparation of tailored bibliographies practical within the staffing constraints of many libraries, once a fairly small capital investment was made for a terminal, modem, and printer. Considerable investment in staff training was also required, but few figures are available on those costs; today it is virtually a given that librarians entering public service positions from library schools will have had online training.

What was remarkable about the advent of online bibliographic searching was the rapidity with which the technology was diffused once it became commercially available, especially given the common historical view that librarians were averse to technological change. Though many public libraries have provided this service to their users only as recently as this decade, large numbers of special and academic libraries adopted the innovation early on. An argument frequently made in favor of providing online service as part of the reference library was that a high-technology approach to service would bring benefits to librarianship in the form of higher status and salaries for the occupation.[24]

Service Allocation and the Breakdown of the Traditional Model

Online searching, like the maximum service theory out of which it grew, poses significant problems in allocating service to users. Some of these were recognized a decade ago; others are only now becoming fully understood. In the mid-1970s the practice of charging individual users for online searches engendered a vociferous but rather brief debate, commonly referred to as the "fee or free" debate. The rush to adopt the new technology through assessing fees for its use flew in the face of the strong tradition of public service provided without charge. This tradition followed the intellectual origins of modern American librarianship as a particular form of charity. Many reference librarians voiced concerns that charging a fee for online searching would effectively exclude many users from receiving that service; and some public libraries based policy decisions not to offer online searching on the argument that fees would engender inequities in service. On the other hand, justifications for charging were offered in the literature,[25] providing a smattering of economic theory to back up an essentially political, not economic, decision to charge.[26]

One argument justifying fees asserted that online searching was appropriate only for sophisticated or highly specialized user needs, an essentially tautological argument when one recognizes that "sophisticated" really means "able to pay." Maina's early survey of undergraduate online users,[27] as well as a wealth of more recent experience with databases such as those produced by Information Access Corporation and the H.W. Wilson Company, clearly demonstrate the speciousness of that argument.

Although those who originally designed the online bibliographic systems envisioned use of these systems directly by engineers, scholars, and others needing the information, librarians in the main argued that they themselves should function as intermediaries between their clients and the systems, which were admittedly not well engineered for immediate use by the novice. In earlier years, with very limited public understanding of the systems, libraries served the online industry well as retail outlets. It was later recognized, however, that libraries' strong adherence to an intermediary role restricted the potential market for online services, since libraries were not able to expand staffing significantly to perform this function. With the enhancement of status that online reference service (a new core task) was seen to bring to librarianship, combined with the maximum service ideal it appeared to fit, surrendering the intermediary role has been a difficult and slow process for public services librarians, and is not yet completed.[28] The service allocation issues inherent in the implementation of online bibliographies have become fully evident only with the advent of other, related technological advances, as described below.

Other Research on Reference Services

There have been other developments in research on question-answering reference work, but in practice none has been sufficiently powerful to challenge the notion implicit in the classical model that reference librarians could successfully meet the information needs of any and all users. Patrick Wilson's work on the limits of catalogs and advice-giving[29] argues persuasively that librarianship should take a more realistic approach to problems of information retrieval, recognizing the contextual nature of relevance judgments. Swanson[30] has also demonstrated indirectly that the idea of the intermediary expert is a flawed one.

Surprisingly little work has been done on assessing the costs associated with reference service,[31] aside from studies concerned with comparing the costs of online and manual searching.[32] In regard to costs, it should be noted that the new technology did bring costs down radically in some areas, allowing the rise of a new occupational group: the information brokers. Information brokering provides an extra-institutional alternative for those seeking information and willing to pay, though these businesses rely to some degree on infrastructures developed by libraries and publishers. This development may be expected to raise more strongly the question of how much reference service costs and whether there may be cheaper alternatives.

Alternatives to the classical model, when proposed, were often rejected out of hand without careful evaluation. The valuable ground-breaking work of Robert Taylor on the concept of question negotiation,[33] intended as a prolegomenon to research on machine-based question answering, was incorrectly interpreted as practical advice for the reference librarian to be sure to negotiate questions. Subsequent work, such as that of Lynch,[34] demonstrating that question negotiation is not common, has reinforced that misinterpretation. Bunge[35] has at least opened the question of using alternative providers of service, and others have argued for the use of students at reference service desks.[36] Experimentation with alternative service modes has not been widespread among practitioners, however, or at least not widely reported.

Before the advent of the bibliographic instruction movement, described in the next section, little appeared within librarianship to challenge the classical model of maximum service, although developments elsewhere in the social sciences could have encouraged consideration of service alternatives had researchers in librarianship been in closer communication with researchers in those fields. For example, Gregory Bateson's work on interpersonal communication,[37] which had a wide influence on cybernetic theory, family therapy, and the new anthropology, centered in large measure around the boundedness of questions and the contexts implicit in question-asking or learning situations. Erving Goffman's work in sociology on cognition and public behavior,[38] though more than two decades old, offers rich insight into the problem of why library patrons don't ask questions. More recently, work in cognitive science, such as that of Schank and Abelson[39] and Minsky,[40] which builds on Bateson, Goffman, and others, conceptualizes public perceptions that are highly relevant to issues that are faced daily by public services librarians: What do questioners expect in terms of answers? How do traditional stereotypes of librarians affect desk service? Why do questioners so often not ask specifically about what they are looking for? How do the physical arrangements of libraries affect which questions are asked? And again, Why don't they ask questions? Approaching these problems without the baggage of the information dogma, which researchers within librarianship so often bring, may offer a new framework for looking afresh at how services are allocated in libraries. Recent research work in Europe is recognizing the value of the new interdisciplinary approaches.[41]

User Education and Training

One public services activity inconsistent with the general working theory that library users should be provided whatever information they want has been instruction in library use. The interest in encouraging library users to become more self-reliant by teaching them to use reference resources effectively dates back as far as Green. Especially in school and academic libraries, where the parent organization's goals are met with programs to educate students in library use, user training programs have found support among librarians. More recently, some public libraries have experimented with the development of programs to train their users. Hardesty, Schmitt, and Tucker[42] have documented the early history of what has become known as the "bibliographic instruction movement."

Despite its historic respectability, the initial movement to teach library users greater self-sufficiency contrasted sharply with the traditional information-providing model. Anita Schiller,[43] in an article that is still widely cited, argued that instructional programs were poor substitutes for in-depth service, and many library school educators supported that view,[44] consistent with their interest in promoting a service model that would enhance the professionalization of their field. Teaching users to conduct their own searches for information, it was argued, did not challenge librarians to exercise their full professional capacities to provide expert help. Providing education programs was seen as leading to abdication of the librarian's responsibility for retrieving information on behalf of users. This viewpoint dominated during a period of great growth in the post-Sputnik era, as computing technology and a fledgling information science first came on the scene, promising to release librarianship from its stereotyped image as a largely clerical occupation. Online searching technology, and its application in a strictly mediated mode, served later to reinforce this viewpoint.

In the late 1960s, however, a resurgent interest in library user education began to appear, within less than a decade assuming the appearance of a social movement within the occupation. Beginning with the experimental work of Patricia Knapp,[45] and then with the more widely known work of Evan Farber and his colleagues at Earlham College,[46] the movement found enormous support among younger academic public services librarians active in the American Library Association. One result was the creation of a Bibliographic Instruction Section within the larger organization's college and research library division (ACRL). Support for this movement stemmed from two sources: the concurrent larger "faculty status" movement, by which academic librarians sought recognition on a par with teaching faculty, and a more general but not widely recognized deprofessionalization movement among new members of many service occupations, reflecting the activist concern of the 1960s for empowering clients of the helping professions.[47] Much of the literature in support of user education acknowledges the grassroots nature of the movement, and decries the seeming lack of concern for the activity among senior library administrators. Recent growing support for user education from faculty and national leaders in higher education may change this perception.[48]

Why is the user education movement so significant if its orientation is largely to academic libraries? First, because academic libraries have historically been an important proving ground for new service models. (It was at Columbia that Dewey instituted the catalog assistance desk, and at Ohio State, MIT, Georgia Tech, and a few other academic libraries that online searching first reached a sizable clientele.) Second, and more significantly, because user education recasts the classical service model by rejecting the notion that the librarian serves only those who ask questions at reference desks. In this sense, by redefining the client group to include all those served by the library, rather than only those who seek reference service, a critical decision about service allocation is made -- a decision that favors broad allocation of a particular level of service (i.e., empowering users for better self-service) over the provision of maximum service exclusively to those who seek it.

Drawing an analogy from another field, the user education movement resembles a public health perspective toward disease, whereby training resources are directed toward prevention, as opposed to a medical perspective, whereby resources are directed toward the treatment of diseases by doctors. Extending the analogy, online searching provided through intermediaries is something like high-technology medicine, an expensive service supported in part institutionally, which may be useful only for the treatment of a rare disease. Scholars have noted that the consequences of such specialized allocation decisions made by professionals have not been, on the whole, in the best public interest.[49]

The range of activities undertaken by librarians committed to user education has been wide, from the creation of user guides to slide/tape orientation programs, to special courses or lectures on bibliographic tools and library methods integrated into other courses. Although user education activities in recent years have mostly been accomplished without adding to the size of reference staffs, larger academic libraries have often designated coordinating positions for the activity from within the ranks of public services personnel. This "add-on" nature of user instruction activity may be a factor in the librarian burnout issue noted earlier, but libraries generally have not seen fit to curtail the activity despite the limited resources available for carrying it forward.

Both supporters and detractors of the movement have called for evaluation of the effectiveness of user education of programs. Although there is a body of literature on bibliographic instruction evaluation,[50] proof of instructional effectiveness seems of less concern than evaluating the effort expended toward developing coherent and well-designed programs that may reach large numbers within the overall client community.

User Education and the Introduction of New Technologies

What is especially important about the current direction of user education is its recent emphasis on educating users about the new information retrieval technologies and, in some institutions, information management technologies.[51] User education advocates have argued that mediated online searching is not viable over the long run because it severely limits the clientele for the technology.[52] They have instituted many programs offering what is referred to as "end-user searching," training students to become proficient in the use of systems that are increasingly designed to accommodate the occasional user.

At the same time that end-user search systems have become a reality in libraries of all types, online public access catalogs have come on the scene, leading to a whole new range of concerns for public services librarianship. Not only is a new training task presented,[53] but public services librarians are increasingly being called upon to participate in decisionmaking about the catalog. Issues such as where terminals are to be placed, how information from catalog records is to be formatted on the computer screen, what online help screens are to be provided, and who is to provide assistance to remote dialup users of the catalog are adding new complexity to the work of public services librarians.[54] The user education movement has been an important precursor to tackling these issues. Its concern for the whole client community has reoriented the perspective of the reference librarian from the information needs of individual clients toward the larger systems that all library users confront as they attempt to solve their own library problems.

How is the role of the public services librarian evolving? In large part, the change is reflected in the new attitudes emerging from the user education movement and the new technologies. Among the advances that should change public services librarianship significantly are: (1) increasing availability of remote and local end-user search systems both in and outside libraries, and artificial intelligence systems with icon-based interfaces for responding to both routine and non-routine questions; (2) a user population increasingly sophisticated in a variety of computing application areas; (3) availability of improved software products that encourage library users to integrate computing applications in their day-to-day work; and (4) pervasive availability of computing power and textual, numeric, and graphic data commonly accessible in machine-readable form. All these changes lie in large measure beyond libraries' walls at the present time, but the field will rely heavily on public services librarians to integrate them and redesign library services to accommodate the changed information environment.

The change in public services perspective might be seen in terms of value added, which implies supplementing and enhancing products or services originating beyond the realm of libraries.[55] Anticipated changes might relate to definition of service roles, adoption of computing technologies, development of new computing applications, and provision of new services. Haro,[56] Martell,[57] Matheson,[58] and especially Lancaster[59] have suggested models of service that take the public services librarian beyond the walls of the library building, functioning as a teacher and consultant on information management technologies. Some of the projects in public libraries, such as those at Pike's Peak Regional Library[60] and libraries experimenting with other new technologies,[61] offer similar forward-looking models. Beyond the literature of librarianship, other models have been developed by people working in alternative media, cable, and computing as applied to community organizing that may usefully inform thinking in this field.[62]

Service Development in Public Libraries

Service development in public libraries has been guided by an increased awareness of the political bases of support for libraries, and to a lesser extent by the exploitation of the opportunities provided by new technologies. Such guiding forces have been on the whole exceptionally effective in garnering continued financial support for libraries in the face of the cutbacks imposed by many local governments in other areas. Although there has been internal controversy among managers of public libraries regarding the political merits of technological advances and the development of new services,[63] this debate does not seem to have had an adverse effect on the political process that continues to support public library development.

Two very conscious strategies seem to be at work to build political support for public libraries, both apparently successful: public relations campaigning, and targeting services for carefully defined constituencies. Public relations work, coordinated effectively through such organizations as the American Library Association's

Public Information Office and the Center for the Book at the Library of Congress, have brought considerable public attention to library services. National Library Week campaigns and, interestingly, occasional features on the Johnny Carson Show provide effective reminders of the library's ability to answer reference questions. Book discussion groups have undergone recent revival through the "Let's Talk About It" program, funded in part by the National Endowment for the Humanities. Readers' advisory services have also been promoted through such programs as the "Read More About It" television spots coordinated by the Center for the Book and CBS.

The targeting of services to special constituencies has garnered considerable public attention as well. Responding to widely recognized social problems, such as the information needs of the small businessperson and the job-seeker, public services librarians have built new services, expanded reference collections, and reached out to new client groups. The growing recognition of the need for drastic educational reform in the U.S. led to the publication of Alliance for Excellence: Librarians Respond to A Nation At Risk,[64] a book encouraging the development of literacy education and other lifelong learning programs at public and other libraries. Other service targeting efforts have included the development of information and referral services to meet special needs of the urban poor, and library outreach services for our growing population of the aged.

Computer technologies have also offered public library managers opportunities to capture media attention, conveying in a new way the vitality of library public services. Activities such as unveiling a new online catalog, making a database on optical disc available for use by high school students, and offering online searching to the business community generate media interest that can build political support for all the library's programs. Library automation activities, in fact, offer many members of the general public their first direct experience with interactive computer systems. Automation experiments that give the public new services -- online community information, a library catalog available to home computers, a chance to investigate how a microcomputer works without having to buy one -- are becoming more common features of public library programs. Computing innovations in the future may make such automation activities a standard component of service delivery in many libraries.

Special Libraries and the New Technologies

For special libraries, the new technologies present a "good news, bad news" dilemma. On the positive side, online computer literature searching, online catalogs, and a growing variety of both printed and computerized information products all provide special libraries improved means of delivering service to their sponsoring organizations. These factors, combined with the work of such popular authors as John Naisbitt and Alvin Toffler[65] highlighting information as a valuable economic resource, have led to optimistic projections about the future for library-centered information services in organizations.

On the other hand, advances in information-processing technologies and the rise of new information enterprises independent of libraries pose new challenges for special libraries. Microcomputers equipped with modems are becoming widespread in many office environments, opening up new possibilities for radically decentralized online searching conducted directly by those who will use the information retrieved. The recent appearance and rapid growth of online searching techniques oriented primarily to a lay business audience[66] serve to support this trend. Systems like CompuServe, The Source, and Easy-Net are featured in popular magazine articles and movies. At the same time, a growing trend among online vendors toward product development in support of vertical markets, as evidenced by such tools as Business Connection and BRS/Saunders Colleague, is increasing the availability of extra-library information alternatives. Still another trend which threatens the quasi-monopoly that special libraries have traditionally held in providing information service is the rise of information brokering and document delivery services, offering corporations and other organizations a pay-as-you-use alternative to the library.

In large organizations with well-established and vital special library operations, the new information products and services may be seen as valuable supplementary sources, enabling the special librarian to deliver a superior, more comprehensive, and more timely product than ever before possible. In these larger special libraries, the growth of extra-library information retrieval activity through end-user searching and purchased information services may be seen as contributing to the library's objective of building an information-rich organization. Librarians gain positive recognition for their unique organizational role by providing training and related services. Among such services might be an information consumer advisory service, sharing with other professionals the special expertise librarians have developed in evaluating the quality of commercially available information products.

In smaller organizations the story may be different. If a special library does exist in such an organization, its continued existence may depend on bearing up under increasingly rigorous cost-benefit scrutiny. In such situations, providing high-quality information service depends on information professionals with the ability and sense of vision to build new services. These services must transcend traditional concepts of the library as a physical and necessarily centralized entity within the organization. The excitement of this challenge has been recognized by many throughout librarianship. In particular, many library schools have modified their curricula, and sometimes their names, to reflect a new emphasis on information services not necessarily tied to libraries. How clearly and completely this new vision of information service may be articulated in organizations has enormous implications not only for the future of special libraries but also for other types of libraries. Any significant successes achieved in this area may provide useful models for higher education, public library service development, and even library development in our primary and secondary schools.

New Technology, New Service Models, and Research Priorities

New computing technologies can be expected to offer new ways of providing information to library users. The terms "expert systems" and "artificial intelligence" are appearing with greater frequency in library literature, though actual system implementations are as yet rather primitive as compared with developments in the field of artificial intelligence as a whole.[67] Work now underway in several research libraries, including those at the National Agricultural Library, the National Library of Medicine, and Northwestern University,[68] promises to offer natural-language-based computer interfaces to help library users locate reference works appropriate to their problems. There is a great deal of work going on outside librarianship in graphics-oriented interface design, work that may well find useful applications in the constant direction-giving assistance currently provided by reference librarians. Work is also moving forward to modify the online catalog to do more work than the card catalog has traditionally done, such as including periodical index databases, providing general library information, and serving as a suggestion or question box for a variety of user queries.

Public services librarians are in a particularly good position to advise systems analysts on the development of new computing applications, owing to their intimate knowledge of how users go about the myriad mundane tasks of gathering information. Bibliographic data management software, for instance, can be enhanced by a variety of design decisions. Librarians are also gaining experience in the use of other file managers as they build community information and referral service files, local newspaper indexes, and other special finding aids that rely on general-purpose microcomputer software. It can be anticipated that as more experience is gained and the pool of expertise grows, the sharing of such tools will greatly enrich public services. Work in computer-assisted instruction of library users is also progressing.[69]

With these developments underway, how might the research agenda for library public services be recast for the next five to ten years? First, serious attention is still warranted on the longstanding issues of why users don't ask questions, and information versus instruction. Research should be theoretically grounded in concepts drawn from the social and cognitive sciences. The literature in these areas, as noted here, is potentially very enriching to librarianship, and library schools and other research centers with responsibility for promoting research should place more emphasis on an interdisciplinary approach to long-recognized library problems than they have heretofore.

Second, it must be recognized that technological advances offer possibilities for radical restructuring of service, in many cases likely reducing the investment of intermediary time in providing service to users. The economics of this transformation are complex. Librarianship has generally not conceived of costs for staff and for materials as exchangeable, but new technologies increasingly raise this possibility. Sophisticated analyses are needed, drawn from economics and public policy research.

Third, substantial advances are being made outside libraries in expert systems, but these are all within highly limited domains of knowledge, and thus may not have a ready market in libraries. If libraries are to play any significant role in this kind of automation development, grassroots-level research must be supported much more vigorously than it has been to date. Management expectations that libraries will be centers for many computer-based information tools may be severely disappointed unless more resources are allocated to training and research within libraries.

Further research in a number of areas is urgently needed if the field is to build sufficient momentum for disseminating widely innovative public service practices. Longstanding problems may find solution through approaches from other social science disciplines. Automation development, in which most of the progress up to now has been driven by entrepreneurial efforts within the private sector, will require increased support from libraries and other public sources. Research is needed that may provide a more systematic picture of the degree and speed of innovative public service practices in libraries across the country, as is research on effective training of librarians to encourage their active participation in innovation. Finally, a more complete and comprehensive service model for librarianship is needed, which takes into account the full range of information needs in our society as well as the information technologies that may be shaped to meet those needs.

Notes and Bibliography

1. Harris, M. Review of "Research in librarianship" (ed. M. J. Lynch, *Library Trends* 32(4) 1984), *Library and Information science Research* 8(1) 1986, 108-112.

2. Garrison, D. *Apostles of Culture: The Public Librarian and American Society, 1876-1920*. New York: MacMillan, 1970. Bledstein, B. *The Culture of Professionalism: The Middle Class and the Development of Higher Education in America*. New York: Norton, 1976.

3. Green, S. S. "Desirableness of establishing personal intercourse and relations between librarian and readers in public libraries," *Library Journal* 1 1876, 74-81.

4. Vann, S., ed. *Melvil Dewey, His Enduring Presence in Librarianship*. Littleton, Colorado: Libraries Unlimited, 1978.

5. Rothstein, S. *The Development of Reference Services through Academic Traditions, Public Library Practice and Special Librarianship*. Chicago: Association of College and Reference Libraries, 1955 (ACRL Monograph 14).

6. Flexner, A. *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching*. New York: Carnegie Foundation, 1910. "Is Social Work a Profession?" *School and Society* 1(26) 1915, 901-911.

7. Bucher, R., and Strauss, A. "Professions in process," *American Journal of Sociology* 66 1961, 325-334.

8. Atkin, P., ed. *Bibliography of Use Surveys of Public and Academic Libraries: 1950-1970*. London: Library Association, 1971. Ford, G., ed. *User Studies: An Introductory Guide and Select Bibliography*. Sheffield, England: University of Sheffield Centre for Research On User Studies, 1979. Albright, J. B. "Bibliography of community analyses for libraries," *Library Trends* 24(3) 1976, 619-643.

9. Wyer, J. I. *Reference Work: A Textbook for Students of Library Work and Librarians*. Chicago: American Library Association, 1930.

10. Rothstein, S. "Reference service: The new dimension in librarianship," *College and Research Libraries* 22 1961, 11-18.

11. Lawson, A. V. Reference Service in University Libraries: Two Case Studies. Dissertation, Columbia University, 1971. See also Jestes, E. C., and Laird, D. "A time study of general reference work in a university library," Research in Librarianship 2 1968, 9-16.

12. Rosengren, W. R., and Lefton, M. Organizations and Clients: Essays in the Sociology of Service. Columbus, Ohio: Charles E. Merrill, 1970.

13. Wagers, R. "American reference theory and the information dogma," Journal of Library History 13(Summer) 1978, 265-281.

14. Robbins, J. "The reference librarian: A street-level bureaucrat?" Library Journal 97(8) 1972, 1389-1392.

15. Lancaster, F. W. The Measurement and Evaluation of Library Services. Washington, D.C.: Information Resources Press, 1977.

16. Swope, M. J., and Katzer, J. "The silent majority: Why don't they ask questions?" RQ 12 1972, 161-166.

17. Fisher, J. D., Nadler, A., and DePaulo, B. M., eds. New Directions in Helping. Vols. 1-3. New York: Academic Press, 1983-1985.

18. Crowley, T., and Childers, T. Information Service in Public Libraries: Two Studies. Metuchen, New Jersey: Scarecrow Press, 1971.

19. Meyers, M., and Jirjees, J. The Accuracy of Telephone Reference/Information Services in Academic Libraries: Two Studies. Metuchen, New Jersey: Scarecrow Press, 1983.

20. Hernon, P., and McClure, C. Unobtrusive Testing and Library Reference Service. Norwood, New Jersey: Ablex, 1987.

21. "Library reference service: An unrecognized crisis," Journal of Academic Librarianship 13(2) 1987, 69-80. Participants in this symposium included Peter Hernon and Charles McClure, William Miller, Thomas Childers, Beth Shapiro, Evelyn Daniels, and Duane Webster.

22. Miller, W. "What's wrong with reference: Coping with success and failure at the reference desk," American Libraries 15(5) 1984, 303-306.

23. Bunge, C. "Potential and reality at the reference desk: Reflections on a return to the field," Journal of Academic Librarianship 10(3) 1984, 128-132.

24. Kilgour, F. "The impact of technology on libraries," in The Information Society: Issues and Answers, ed. E. J. Josey. Phoenix, Arizona: Oryx Press, 1978. Atherton, P., and Christian, R. Librarians and Online Services. White Plains, New York: Knowledge Industries, 1977. Cogswell, J. A. "Online search services: Implications for libraries and library users," College and Research Libraries 39(4) 1978, 275-280.

25. Gell, M. K. "User fees I: The economic argument," *Library Journal* 104(1) 1979, 19-23. Linford, J. "To charge or not to charge: A Rationale," *Library Journal* 102(17) 1977, 2009-2010.

26. For a useful explanation of the difference, see Boulding, K. *Human Betterment*. Beverly Hills, California: Sage, 1985.

27. Maina, W. "Undergraduate use of online bibliographic retrieval services: Experiences at the University of California, San Diego," *Online* 1(2) 1977, 45-50.

28. Nielsen, B. "Online bibliographic searching and the deprofessionalization of librarianship," *Online Review* 4(3) 1980, 215-224.

29. Wilson, P. *Two Kinds of Power: An Essay on Bibliographic Control*. Berkeley: University of California Press, 1968. Wilson, P. *Public Knowledge, Private Ignorance: Toward a Library and Information Policy*. Westport, Connecticut: Greenwood, 1977. Wilson, P. *Second-hand Knowledge: An Inquiry into Cognitive Authority*. Westport, Connecticut: Greenwood, 1983.

30. Swanson, D. R. "Information retrieval as a trial-and-error process," *Library Quarterly* 47(2) 1977, 128-148.

31. Orr, R. H., *et al*. "Development of methodologic tools for planning and managing library services. III. Standardized inventories of library services," *Bulletin of the Medical Library Association* 56 1968, 380-403. Olson, E. E. *Survey of User Service Policies in Indiana Libraries and Information Centers*. Indiana Library Studies Number 10. Bloomington, Indiana: Indiana State Library, 1970. Palmour, V., and Gray, L. M. *Costs and Effectiveness of Interlibrary Loan and Reference Activities of Resource Libraries in Illinois*. Springfield: Illinois State Library, 1972. Kantor, P. *Objective Performance Measures for Academic Research Libraries*. Washington, D.C.: Association for Research Libraries, 1985.

32. See, for example, Elcheson, D. R. "Cost-effectiveness comparison of manual and on-line retrospective bibliographic searching," *Journal of the American Society for Information Science* 29 1978, 56-66. Kidd, J. S. "Toward cost-effective procedures in online bibliographic searches," *College and Research Libraries* 38(2) 1977, 153-158.

33. Taylor, R. S. "Question-negotiation and information seeking in libraries," *College and Research Libraries* 29 1968, 178-194.

34. Lynch, M. J. "Reference interviews in public libraries," *Library Quarterly* 48(2) 1978, 119-142.

35. Bunge, C. *Professional Education and Reference Efficiency*. Ph.D. Dissertation, University of Illinois at Urbana-Champaign, 1967.

36. Aluri, R., and St. Clair, J. "Academic reference librarians: An endangered species?" *Journal of Academic Librarianship* 4 1978, 82-84.

37. Steps to an Ecology of Mind. New York: Ballantine, 1972.

38. Behavior in Public Places: Notes on the Social Organization of Gatherings. New York: Free Press, 1963. Frame Analysis: An Essay on the Organization of Experience. Cambridge, Massachucetts: Harvard University Press, 1974.

39. Shank, R., and Abelson, R. Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, New Jersey: L. Erlbaum, 1977.

40. Minsky, M. "A framework for representing knowledge," in The Psychology of Computer Vision, ed. P. H. Winston, 211-277. New York: McGraw-Hill, 1975.

41. Ingwersen, P. "Cognitive analysis and the role of the intermediary in information retrieval," in Intelligent Information Systems: Progress and Prospects, ed. R. Davies. Chichester, United Kingdom: Ellis Horwood, 1986.

42. Hardesty, L., Schmitt, J., and Tucker, J. User Instruction in Academic Libraries: A Century of Selected Readings. Metuchen, New Jersey: Scarecrow Press, 1986.

43. Schiller, A. "Reference service: Instruction or information," Library Quarterly 35(1) 1965, 52-60.

44. Katz, W. Introduction to Reference Work, 3rd ed. Vol. II, "Reference Services and Reference Processes." New York: McGraw-Hill, 1978. Galvin, T. "The education of the new reference librarian," Library Journal 100(8) 1975, 727-730. McClure, C. "A reference theory of specific information retrieval," RQ 13 1974, 207-212.

45. Knapp, P. The Monteith College Library Experiment. Metuchen, New Jersey: Scarecrow Press, 1966.

46. Kennedy, J. R. "Integrated library instruction," Library Journal 95(9) 1970, 1450-1453. Farber, E. "Library instruction throughout the curriculum: Earlham College program," in Educating the Library User, ed. J. Lubans, 145-162. New York: Bowker, 1974. Kirk, T. G. "Problems in library instruction in four-year colleges," Ibid., 83-103.

47. Ross, R. J. S. "The impact of social movements on a profession in process: Advocacy in urban planning," Sociology of Work and Occupations 3(4) 1976, 429-454. Nielsen, B. "A comment: Undercurrents in the value premises of the 'first generation,'" in Bibliographic Instruction, The Second Generation, ed. C. Mellon. Littleton, Colorado: Libraries Unlimited, 1987.

48. See, for example, Weiskel, T. C. "Bibliographic research and the love of learning," Perspectives in Computing 5(3/4) 1985, 13-21, for a faculty view; and Boyer, E. College: The Undergraduate Experience In America. New York: Harper and Row, 1987, for an endorsement of user education from a major national figure in higher education.

49. Starr, P. *The Social Transformation of American Medicine*. New York: Basic Books, 1982. Fuchs, V. *Who Shall Live? Health, Economics, and Social Choice*. New York: Basic Books, 1975.

50. Werking, R. "Evaluating bibliographic education: A review and critique," *Library Trends* 29(1) 1980, 153-172. *Evaluating Bibliographic Instruction: A Handbook*. Chicago: Bibliographic Instruction Section, ACRL, American Library Association, 1983.

51. Curtis, H., ed. *Public Access Microcomputers in Academic Libraries: The Mann Library Model at Cornell University*. Chicago: American Library Association, 1987. Matheson, N. *Academic Information in the Academic Health Sciences Center: Roles for the Library in Information Management*. Washington, D.C.: Association of American Medical Colleges, 1982.

52. Nielsen, B. "Teacher or intermediary: Alternative professional models in the information age," *College and Research Libraries* 43(3) 1982, 183-191.

53. McClintock, M. H., ed. *Training Users of Online Public Access Catalogs: Report of a Conference Sponsored by Trinity University and the Council on Library Resources*. Washington, D.C.: Council on Library Resources, 1983. Nielsen, B., and Baker, B. "Educating the online catalog user: A model evaluation study," *Library Trends* 35(4) 1987, 571-585.

54. Nielsen, B. "Online reference and 'The Great Change,'" in *Online Catalogs, Online Reference: Converging Trends*, 74-88. Proceedings of a 1983 LITA Preconference. Chicago: American Library Association, 1984.

55. Taylor, R. *Value-added Processes in Information Systems*. Norwood, New Jersey: Ablex, 1986. Griffith, B., White, H. D., Drott, C., and Saye, J. "Tests of methods for evaluating bibliographic databases: An analysis of the National Library of Medicine's handling of literature in the medical behavioral sciences," *Journal of the American Society for Information Science* 37(4) 1986, 251-270. Smith, K. A. "Medical information systems," *Bulletin of the American Society for Information Science* 12(4) 1986, 17-18.

56. Haro, R. "The floating academic librarian," *American Libraries* 2(11) 1971, 1169-1173.

57. Martell, C. *The Client-Centered Academic Library: An Organizational Model*. Westport, Connecticut: Greenwood Press, 1983.

58. Matheson, N. "The academic library nexus," *College and Research Libraries* 45(3) 1984, 207-211.

59. Lancaster, F. W. *Libraries and Librarians in an Age of Electronics*. Arlington, Virginia: Information Resources Press, 1982.

60. Dowlin, K. *The Electronic Library: The Promise and the Process*. New York: Neal-Schuman, 1984.

61. Dewey, P. Essential Guide to Bulletin Board Systems. Westport, Connecticut: Meckler, 1987.

62. Hess, C. Community Technology. New York: Harper & Row, 1979. Zharska, L. "Communication, liberation, and learning exchanges," Journal of Community Communications 3 1978, 16-20.

63. Ballard, T. "Dogma clouds the facts: Public libraries need proof of benefits before spending millions on resource sharing," American Libraries 16 1985, 257-259. Martin, L. Public Library: Middle-Age Crisis or Old Age? New York: Bowker, 1983.

64. Alliance for Excellence: Librarians Respond to A Nation At Risk. Washington, D.C.: U.S. Department of Education, 1984.

65. Naisbitt, J. Megatrends: Ten New Directions Transforming Our Lives. New York: Warner Books, 1982. Toffler, A. The Third Wave. New York: Morrow, 1980.

66. Examples include Glossbrenner, A. How to Look It Up Online: Get the Information Edge With Your Personal Computer. New York: St. Maring, 1987; and the popular journals LinkUp and Online Today.

67. Smith, K. "Robot at the reference desk?" College and Research Libraries 47(5) 1986, 486-490. Ford, B. "Reference beyond (and without) the reference desk," College and Research Libraries 47(5) 1986, 491-494. Waters, S. "Answerman, the expert information specialist: An expert system for retrieval of information from library reference books," Information Technology and Libraries 5(3) 1986, 204-212. Parrott, J. R. "Expert systems for reference work," Microcomputers for Information Management 3(3) 1986, 155-171.

68. Krulee, G., and Nielsen, B. An Intelligent Support System for the Reference Librarian. Grant supported by the Council on Library Resources, 1987.

69. Culkin, P., and Walker, E. "Computers in user education," Reference Services Review 12 1984, 75-78. Baker, B., and Nielsen, B. Review of "Library research skills: Four programs for the IBM PC," RQ, 26(3) 1987, 379-382.

Comments by Reviewers

The three reviewers who commented on this article addressed the issues of user needs and education, as well as suggested role changes. They proposed alternative approaches to the topic area, additional courses of investigation, and additional research objectives.

User Needs and Education

Nielsen examines library studies public service from the vantage point of traditional duties such as question-answering, performing literature searches, teaching the use of the library and bibliographic tools, and providing advisory services to readers. Other current and emerging issues could be considered in planning further research in this area, such as the role of the public services librarian in implementing new models of service and the use of programming in addressing the library needs of existing or unreached populations.

He assesses the bibliographic instruction movement both historically and in terms of its future prospects. Two other works are recommended for further reading on this issue. First is the article "Primed for Success" in the Ohio Library Association Bulletin, October 1986. The second is Opening the Attic Door: Bibliographic (and Other) Instruction at the Port Washington Public Library, from The Bookmark, Fall 1979.

Suggested Role Changes

Nielsen evaluates the traditional view that has dominated research in public services librarianship. He maintains that this model ". . . places the librarian intermediary in the powerful position of determining the nature of the information need, and places the client in a dependent position." The reference interview, a recently developed technique for identifying user needs, warrants research to prove whether it can successfully determine the kinds of reference material the client seeks.

Along the same line, Nielsen stresses the need for the public and reference service librarians to "surrender the intermediary role" that has been played for so many years. More research is necessary to assess whether the role can be abandoned without overwhelming the user with the mass of information and material resources available to him.

Additional Research Objectives

- Nielsen asserts that using research on information seeking behavior patterns of scholars in other fields will yield useful information for the public services librarian. A 1986 University of Pittsburgh doctoral dissertation by Abdelmajid Bouazza, Use of Information Sources by Physical Scientists, Social Scientists, and Humanities Scholars, is recommended as an additional resource for such research.

- Nielsen mentions the fee vs. free debate. Librarians are divided on this issue: some academic librarians and public library administrators feel that when new technological services such as online databases or databases on CD-ROM are substitutes for books and journals, it is appropriate to pay for them from library materials budgets or otherwise to subsidize their use. More extensive research would help establish the most feasible route to take. Two librarians, the late Hugh Atkinson and Marilyn Gell Mason, contributed articles discussing the fee vs. free issue in a 1986 issue of Collection Building (Vol. 8, No. 1).

- More research on the role of the public services librarian is recommended at the state level.

LIBRARY FUNDING AND ECONOMICS

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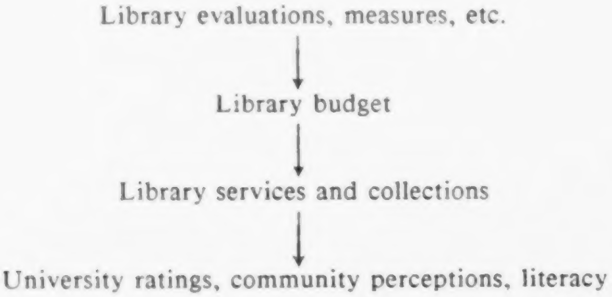
Abstract

Libraries, as service organizations, frequently are part of the non-profit or governmental sector of the economy. As a result, it is difficult to characterize their outputs or measure their productivity. In many cases, the effectiveness of a library is measured by its contributions to a broader organization -- a school or university, a local community, or a corporation or association. To enable libraries to use their resources more efficiently, the linkages between library output measures (e.g., circulation) and the effectiveness of their parent organizations should be explored. Research in the areas of library funding and economics will not only help libraries become more efficient and effective but also provide a better understanding of service organizations in general.

Introduction

This discussion of research in the areas of library funding and economics is based on an implicit model that hypothesizes output measures such as community perceptions or university ratings. Such measures are, at least in part, determined by quantitative measures of library services and collections. In turn, levels of library services and collections are related to budget size, which may in turn be influenced by a variety of political, economic, and social factors. The focus of the research areas proposed below is the investigation of the linkages that may or may not exist between stages of the model. A diagram of the model is shown below. Each of the arrows represents a possible linkage that may provide areas for investigation.


Library evaluations, measures, etc.
Library budget
Library services and collections
University ratings, community perceptions, literacy

In addition to determining the existence of these linkages, we are also concerned with their magnitude and direction. Furthermore, we wish to determine whether any feedback relationships exist and, if so, to measure them.

Each section below starts with a general discussion and then turns to specific research questions or topics. The motivation for each is discussed, along with comments on the directions the research might take.

Determination of Library Budgets

Rarely is the library a standalone organization. Depending on its type (public, academic, school, or special), the library's budget traditionally is determined via a process of negotiation with a "parent" organization. The budgetary process involves a mix of politics, economics, and administrative art. Furthermore, there are both internal and external influences on those involved in budget determination. The research areas described below are designed to develop scientific knowledge about the budget process. This knowledge should be useful to both the players and policymakers; in addition, it may also be applicable to other organizations in the nonprofit, governmental, and service sectors of the economy.

Is there any general, observable linkage between the results of evaluations and the size of future budgets?

Budgets and costs are intrinsically linked. There have been many studies of library costs, and additional ones are proposed below. Occasionally, researchers have linked the problem of understanding costs to the politics of library budgeting. For example, in describing some of the problems of obtaining and analyzing comparable cost data from a sample of academic libraries, Kantor[1] related one source of his difficulties to the budgetary process:

> "The procedure for setting budgets does not take into account levels of service rendered. In fact, a budget is often set on the basis of history, at some fixed fraction of the university budget or the library budget."

Kantor went on to point out that this need not be the case:

> "In principle, the budget process could be changed, so that it would reflect levels of service. This is particularly important in view of the long-range transformation in modes of information storage and retrieval."

There has been comparable discussion and research in the area of evaluation. For example, Orr's classic article[2] contrasted two schools of thought -- one holding that the major benefits from libraries are all intangible and not measurable, the other that measurement is possible and desirable. A significant body of relatively recent research (e.g., Van House et al.[3]) has examined a variety of quantitative measures of library "goodness" and user satisfaction with library collections and services.

It is possible to compare the current state of these areas of research with the status of research into the economics of the regulated industries circa 1965.

At that time we knew a lot about the effects of regulatory constraints on the operations of the firm, but we had less understanding of what motivated the regulators. Similarly, we now need to investigate two related areas that deal with the interface between evaluation and budgeting:

- What evidence exists to indicate that library budgets are or can be affected by the results of evaluations of library operations?
- Assuming that the results of evaluations can have some influence on the budgeting process, what specific assessment information would be most useful and influential?

There are somewhat comparable moves toward the use of specific output measures in other services; the increased use of test scores in evaluating and rewarding school performance is an obvious example. Ideally, we can learn from the difficulties in these other areas when designing mechanisms appropriate for specifics of the library situation.

Is the budget an adequate reflection of the level of demand for library services? How would one determine this?

How can we determine the appropriate size for a library (or other not-for-profit service organization)? Optimal size depends on cost considerations and on levels of demand. (See below for a discussion of cost considerations.) Library managers seek signals on the demand for library services from two sources -- their users and their funding authorities.

One standard approach to the management of operating units sees divisional budgets as constraints facing the divisions' managers in their efforts to meet the organization's goals and objectives. As a standard text on management of not-for-profit organizations clearly states: "The budget is the main vehicle for control within any form of organization."[4]

However, organizations with products to sell in competitive markets can obtain signals from those markets. Understanding those signals helps the manager determine appropriate characteristics for the products and plan for reasonable levels of production. But library managers rarely have this sort of information. Even in corporate libraries with charge-back mechanisms (which are cited here because they are often the closest approximation to a "market" that librarians see), little is known about how changes in service characteristics might change the levels of demand for particular services.

The budgetary process provides information that might serve as a proxy for user demands. But we know little as to how valid a proxy it is. We need to understand more about how budgets are developed and how to make them more reflective of user demands that are hidden by the absence of a market.

Does library use of alternative sources of funding or provision of fee-based services weaken or strengthen tax support?

As in many other areas, there seem to be waves of fashion in the forms that governmental and foundation support take, both for libraries and for other activities in general. At various times in various places, funds have been allocated in forms such as categorical grants, block grants, construction grants, capitation monies, etc. Throughout, libraries have adjusted their budgets to accept and account for some of these funds. In addition, many libraries have introduced fee-based services for some or all of their user populations.

The long-run effects both of accepting a grant for a specific purpose and of generating fees for certain services may be quite different from the short-run effects. Initially, the additional revenues are viewed by all as just that -- extra funds that can enable the library to do something it could not do before their arrival. However, there may be long-run adjustments in the level of general support.

Theoretically, the response of the budgetary authority can fall into any one of four categories:

- **Rewarding**: General sources of support are increased to reward the organization for seeking additional funds and to provide strong incentives for similar future behavior by this or other organizations.
- **Neutral**: There is no change in the level of general support; i.e., the overall budget is at the level of the old budget plus the additional support.
- **Weakly Punitive**: General funds are reduced by an amount that is less than the amount of the additional funds. In this case the organization has grown into new areas, but its budget is tighter overall.
- **Strongly Punitive**: General funds are reduced by an amount greater than the additional funding.

(Budget growth to cover cost increases is assumed in defining each of these cases.)

Anecdotal evidence leads us to believe that the second and third categories are the norm and that the first and fourth are rare. In fact, the third category (weakly punitive) may be quite reasonable if there are truly joint costs that can now be shared over a wider range of library activities. (These circumstances also imply that the second category is mildly rewarding.) It would be both interesting and useful to know the distribution of responses across these categories, and whether such knowledge could help in the design of other plans to augment library revenues.

Effects of Budget Size on Library Outputs

Although there is great variation within and across different types of libraries, each library has two primary functions when viewed from a systems standpoint -- the dissemination function and the repository function. The specific library is characterized both by the mix of these two functions and by the presence or absence of other related functions, such as literacy improvement or provision of meeting space. Over the years many researchers have tried to develop models of efficient library operation. From the economist's point of view, these studies have attempted to measure the effects that changes in the levels of use of various inputs have on library outputs. (See White[5] for a detailed discussion of the problem of separating inputs from outputs.)

Investigation of production and cost functions for libraries remains an area in which additional work may have relatively high payoffs. This is partly due to the fact that service organizations in general, and those in the not-for-profit sector in particular, have been targets for possibly complementary research.

The research proposed here is more focused. The first three sets of research questions below assume that cost or production functions can be estimated and then used in attempts to determine efficient structures and behaviors. The two remaining questions deal with the specific issues of the effects that different sources of funds might have on library service mix and the necessity for changes in library accounting rules.

Is there an optimal structure or size for a library? Are there threshold sizes below which a library cannot be efficient? On the other hand, can a library be too big?

A library produces a variety of outputs, and the cost of library operation may depend both on the mix of these outputs and on their individual levels. For example, the cost of a suburban, single-branch library can be assumed to follow (approximately) the equation below:

$$\text{Total yearly cost} = A + B\,(\text{collection size}) + C\,(\text{circulation})$$

In this situation, all costs except for the amount $\underline{A}$ are uniquely driven by either collection size or circulation; and the average cost, in terms of either component, declines as that component is increased. However, it is possible that neither of these conditions holds in reality. First, the effects of collection size and circulation on costs may be neither linear nor additive; they may actually influence costs in a more complex fashion. Second, the economies that come from increases in collection or circulation may be exhausted at some level. If this were the case, it would be incorrect to expect lower average costs from a large regional facility than from two or more separate community libraries.

The cost function above explicitly recognizes that a library has more than one output. In contrast, White[5] has argued that using circulation as the single measure of output captures most of the differences across libraries of a given type. Additional research is needed to determine whether the complications introduced by a multiple-output approach outweigh the advantages. Furthermore, it is also desirable to compare single-equation approaches, such as suggested above or used by White, with alternative specifications of the cost model. For example, Baumol and Marcus[6] found that almost all of the variation in library costs for a sample of private college libraries could be explained by equations of the form:

207

$$\begin{aligned}\text{Total library operating costs} = {} & A_0 \\ & + A_1\ (\text{volumes held}) \\ & + A_2\ (\text{volumes added}) \\ & + A_3\ (\text{enrollment})\quad ,\end{aligned}$$

and

$$\begin{aligned}\text{Volumes added} = {} & B_0 \\ & + B_1\ (\text{volumes held}) \\ & + B_2\ (\text{expenditures per student}) \\ & + B_3\ (\text{enrollment})\end{aligned}$$

Their approach could be generalized into a simultaneous equations model of library costs.

An additional problem is that most of the statistical methods underlying the measurement of cost relationships assume internal efficiency -- that the organization is using the lowest-cost techniques available to it to produce services of a given level of quantity and quality. That the reality of this assumption is questionable has been widely recognized. For example, again quoting from Braswell:

> "Little attention has been paid to how effective the expenditures have been in achieving the objectives of the organization."[4]

Although there has been research on library cost functions and economies of scale in the past (e.g., Black,[7] Cooper,[8,9,10] Feldstein,[11] Kantor[12]), there is a need for additional empirical work that builds on a strong theoretical framework. The important questions are not the comparability of data or procedures across libraries but the design of studies that can produce useful information on the relationships among library size, structure, and cost of operations.

What are the long-run implications of sharing services and resources, as through interlibrary loans, cooperative buying, collection overlap and duplication agreements, reference referral, etc.? What is the distribution of cost savings across libraries? Do they add costs to individual library operations? Are they cited as reasons for reductions in funding support?

Libraries traditionally have entered into a variety of agreements for sharing resources and pooling certain functions, such as cataloging. For a specific library, however, these agreements may result in one or more of the following complications:

- Operating costs may change.
- Quality of service may change.
- The library may become a "net borrower" or "net lender" vis-a-vis its partners.
- The library's "parents" may seek to change its budget.

In discussions with librarians one often hears stories of pathological outcomes resulting from one or another resource-sharing arrangement. To some extent this may be due to partial analyses, but it is likely that the specifics of certain cooperative agreements will work to the disadvantage of one or more classes of libraries.

The library system in the United States is rather decentralized. Without a formal "library of last resort," such as the British Lending Library, many large libraries may find themselves in the uneconomical position of supplying materials or services to smaller libraries without the hope of reciprocity. At the same time, funding sources in small communities or small colleges may recognize that their libraries are receiving services at less than cost from others and, as a result, realize that they can implement budget cutbacks while maintaining services. (This behavior is similar to the "punitive" response to additional revenue sources described above.)

The existence of a wide variety of cooperative arrangements leads to a need for two types of research:

- A detailed analysis of how the arrangements work and documentation of the resulting benefits and any actual harmful effects; and
- Better theoretical and practical understanding of how one can implement provisions containing incentives for efficient behavior by constituent libraries.

What are the effects of technological change on library costs and on the quality of services in both the short run and the long run?

Traditionally, many library functions have been performed by skilled workers using labor-intensive methods. Increases in overall pay and standards of living have led to the situation that these functions are often increasingly uneconomical, and library managers have responded by adopting new technologies and "de-skilling" the jobs. Detailed explanations for the increases in the cost of library operations have been published by Baumol and Marcus[6] and Baumol and Blackman.[13] (White[5] has presented a somewhat contrary view. For a more general discussion of the problem of productivity in the service sector, see Baumol.[14])

However, the adoption of new technologies rarely affects only costs. For example, the implementation of automated cataloging and circulation systems in libraries can change the basic parameters of library operations. These might include areas as diverse as the relative costs of original versus copy cataloging and the percentage of a collection that is available to borrowers.

Although cases in which automation has failed to lower costs, as well as the existence of non-cost, service-oriented changes resulting from library automation, have both received attention in the literature (see Baumol and Blackman[13] for a review), there is still a lack of knowledge as to how the effects of technological change in libraries can be modeled appropriately. One approach that might provide useful insights would be to incorporate technological change directly into library cost or production functions such as those described above. This technique has proved successful in the modeling of publishing (Pulley and Braunstein[15]) and telecommunications (Evans and Heckman[16]).

Is there a theoretical or empirical relationship between types of financing and the mix of services offered by libraries?

Although, in theory, decisions about the expenditure of funds can be made in isolation from decisions about the obtaining of funds, this is frequently not the case in practice. Specific sums may be earmarked for specific activities, and library managers may have little or no authority to reallocate resources. Nevertheless, the existence of a reasonably large "general fund" can provide a degree of flexibility greater than one might expect from "special funds" in the budget.

If library management can influence or control the budgeting and grant-giving processes so that the pattern of funding reflects internal desires, little autonomy will be lost through the establishment of dedicated funds. On the other hand, budgeting and granting agencies may impose constraints on the use of their funds that critically restrict the choices of management. The research issue is to determine the extent to which the size and character of earmarked funds reflect the interests of internal versus external forces in both budgeting and grant-giving.

Should the accounting requirements for libraries be changed (e.g., should libraries be required or encouraged to produce balance sheets and explicitly recognize depreciation)?

Most not-for-profit organizations use fund accounting and do not record depreciation. (Hospitals are one common exception.) Furthermore, many do not have sinking funds for the replacement of worn-out assets. These accounting conventions lead to situations where library managers have little or no ongoing information on the value of their collections and the state of their buildings and fixtures (in terms of how much would be necessary to reverse the effects of wear-and-tear).

The extent to which these accounting conventions lead to a lack of vital information has been debated by the Financial Accounting Standards Board. (For example, see AICPA[17] for a general discussion and Berton[18] for a related debate in church accounting.) In the ALA's Accounting for Librarians, Smith[19] discusses the specific issue of valuing library collections:

> "In addition, some collections of museums, art centers, art galleries, and libraries also share the characteristic of inexhaustibility . . . . It is understandable that placing a value on these collections is difficult -- if it is possible at all to do so . . . . Summarizing this procedure: An NFP [not-for-profit] does not have to record a value for inexhaustible collections and, consequently, no depreciation is recorded."

Smith also discusses the more general problem of valuing the other (non-collection) fixed assets of a library:

> ". . . many organizations face difficulties because no value has ever been recorded for their assets and there are no records of the original cost of these assets . . . . At the minimum, recording asset values

> increase awareness of the need for an asset-maintenance policy . . . . Without a record of the assets owned by an NFP organization, it is difficult to plan for replacement of assets as they wear out. For employees to request new equipment when old equipment wears out is not a satisfactory policy of asset replacement. Such a 'system' does not allow for replacement of assets in a consistent and systematic manner."

A further complication is that the relationship between collection size and depreciation may be quite complex.[20] For example, in the library setting depreciation may refer to:

- Physical wear and tear on books;
- Exhaustion of stock by its readers (i.e., irrespective of its intrinsic value, the stock no longer has enough unread material to maintain the interest of individual readers); or
- Obsolescence.

Research on possible alternative accounting conventions for libraries could shed light on the degree to which changes might provide additional useful information for library management. Likely problems include the relevance of depreciation for rare books or historic buildings and the cost of periodic appraisals. Nevertheless, if additional information on a library's financial situation can be provided at low cost, changes in accounting practices may be warranted.

Linkages Between Library Outputs and Observable Measures of System Effectiveness

The fact that libraries frequently are constituent divisions of a larger entity (e.g., municipality, university, school, or corporation) has explicitly entered much of the discussion above. Continuing with this framework, we need to address the question of the extent to which the library contributes to the overall objectives of the organization. The specific research questions in this section ask a slightly narrowed version of that question and differ only according to the setting.

For academic libraries: What are the theoretical and empirical relationship between library output measures and university ratings?

Conventional wisdom is that the universities with the best libraries have the best faculties and the best students. But correlations (assuming they exist) do not imply causality. One could imagine a sophisticated research design that might permit a determination of the effects that specific measures of library quality have on the quality of universities, where quality might be measured by faculty rankings, admissions criteria, etc.

University libraries provide a variety of services for their different user groups. What then is the primary contribution of the library: the convenience of its vast collection, the array of bibliographic services it offers to users, or its provision of quiet places for study? Statistically, it may be difficult to separate

211

the effects of multiple library outputs if they are highly correlated with one another, but the possibility of additional understanding of how the library makes its contribution to the university seems a compelling reason to make the effort.

For public libraries: What are the theoretical and empirical relationships between library output measures and community perceptions, literacy, etc.?

Public library user and usage studies have grown beyond the cottage industry stage (see, for example, D'Elia and Walsh,[21] and Harris and Sodt[22]). While the methodology of such studies has evolved from an emphasis on circulation statistics as valid measures of use toward a focus on people as users, significant attention has not been paid to the varied uses that might be made of individual library materials (see Zweizig and Dervin[23]). Furthermore, the lack of theoretical underpinning often causes the results of such studies to be of questionable value to either library managers or policymakers. We need to develop and empirically test valid models that relate public library outputs (i.e., uses) to the satisfaction of community needs and the generation of perceptions of library value.

For special libraries: What are the theoretical and empirical relationships between library output measures and organizational profitability, innovation, etc.?

The corporate or association special library is conceivably the easiest type of library for which one can relate library outputs to overall organizational effectiveness. Many of these libraries have a history of providing "library-like" services (such as storage and control of engineers' notebooks) in a cost-effective manner. Furthermore, it should be possible to build on studies of the variation in patterns of use across professions (e.g., Allen's study of differences in communications patterns between scientists and engineers[24]) and the importance of accessibility (e.g., Culnan[25]).

For school libraries: What are the theoretical and empirical relationships between library output measures and educational achievements and motivation?

There are two, somewhat contradictory, views of the school library. Some see it largely as a convenience, putting certain resources near teachers and students. Others see it as functioning as an integral part of curriculum development and implementation. However, past research has provided little guidance even as to the importance of increased accessibility, let alone which library functions contribute significantly to educational achievement and motivation.

While current thinking stresses the importance of teacher-librarian cooperation and of a multi-media resource-based approach to learning, the success of such programs is measured by classroom performance standards (see review articles by Didier[26] and Marchant et al.[27]). Still lacking are measures that isolate the effects of program participation and relate these to specific measures of library effectiveness.

Conclusion

Of the research areas described above, it is likely that those that focus directly on library operations and their costs will have the highest probability of success. They build on an existing body of high-quality work and can draw on data sets collected by organizations such as the Association of Research Libraries and the U.S. Department of Education. However, the areas that focus on the interrelationships between libraries and other entities, whether as a result of the budgeting process or through the effects that libraries have on their users and their environment, may be both more important and more difficult. Furthermore, the results from research into the latter areas are likely to be useful both to those interested specifically in libraries and to those interested in nonprofit service organizations in general.

Bibliography

1. Kantor, P. B. "Three studies of the economics of academic libraries," in Advances in Library Administration and Organization, eds. G. McCabe and B. Kreissman. Greenwich, Connecticut: JAI Press, 1986.

2. Orr, R. H. "Measuring the goodness of library services: A general framework for considering quantitative measures," Journal of Documentation 29 1973, 315-332.

3. Van House, N. A., et al. Output Measures for Public Libraries: A Manual of Standardized Procedures, 2nd ed. Chicago: American Library Association, 1987.

4. Braswell, R., Fortin, K., and Osteryoung, J. S. Financial Management for Not-for-Profit Organizations. New York: John Wiley & Sons, 1984.

5. White, L. J. The Public Library in the 1980s. Lexington, Massachusetts: Lexington Books, 1983.

6. Baumol, W. J., and Marcus, M. Economics of Academic Libraries. Washington, D.C.: American Council on Education, 1973.

7. Black, S. W. "Library economics," in Libraries at Large: Tradition, Innovation, and the National Interest, eds. D. M. Knight and E. Shepley. New York: Bowker, 1969.

8. Cooper, M. "The economics of library size: A preliminary inquiry," Library Trends 28 1979, 63-78.

9. Cooper, M. "Economies of scale in academic libraries," Library Research 5 1983, 207-219.

10. Cooper, M. "Economies of scale in large academic libraries," Library and Information Science Research 6 1984, 321-333.

11. Feldstein, K. F. *The Economics of Public Libraries*. Ph.D. Dissertation, Massachusetts Institute of Technology, 1977.

12. Kantor, P. B. "Cost and productivity in library operations," in *Proceedings of ASIS Annual Meeting* 20 1983, 297-300.

13. Baumol, W. J., and Blackman, S. A. B. "Electronics, the cost disease, and the operations of libraries," *Journal of the American Society for Information Science* 34(September) 1983, 181-191.

14. Baumol, W. J. "Macroeconomics of unbalanced growth: The anatomy of an urban crisis," *American Economic Review* 57(June) 1967, 415-426.

15. Pulley, L. B., and Braunstein, Y. M. "Scope and scale augmenting technological change: An application in the information aector," in *Communication and Information Economics*, eds. M. Jussawalla and H. Ebenfield. New York: North-Holland, 1984.

16. Evans, D. S., and Heckman, J. J. "A test for subadditivity of the cost function with application to the Bell system," *American Economic Review* 74(September) 1984, 615-623.

17. American Institute of Certified Public Accountants (AICPA), Subcommittee on Nonprofit Organizations. *Audits of Certain Nonprofit Organizations*. New York: AICPA, 1981.

18. Berton, L. "Is nothing sacred? Churches fight plan to alter accounting," *Wall Street Journal* April 16, 1987, 1.

19. Smith, G. S. *Accounting for Librarians and Other Not-for-Profit Managers*. Chicago: American Library Association, 1983.

20. Spiller, D. *Book Selection: An Introduction to Principles and Practices*, 4th ed. London: Bingley, 1986.

21. D'Elia, G., and Walsh, S. "User satisfaction with library service -- A measure of public library performance?" *Library Quarterly* 53(April) 1983, 109-133.

22. Harris, M., and Sodt, J. "Libraries, users, and librarians: Continuing efforts to define the nature and extent of public library use," *Advances in Librarianship* 11 1981, 109-133.

23. Zweizig, D., and Dervin, B. "Public library use, uses, and users," *Advances in Librarianship* 7 1977, 231-255.

24. Allen, T. H. *The Bottom Line: Communication in the Organization*. Chicago: Nelson Hall, 1979.

25. Culnan, M. J. "The dimensions of perceived availability to information: Implications for the delivery of information systems and services," *Journal of the American Society for Information Science* 36(September) 1985, 302-308.

26. Didier, E. K. M. "An overview of research on the impact of school library media programs on student achievement," School Library Media Quarterly 14(Fall) 1985, 33-36.

27. Marchant, M. P., et al. "Research into learning resulting from quality school library media service," School Library Journal 30(April) 1984, 20-22.

Comments by Reviewers

The three reviewers who read this paper commented on the issues of funding methods, the differing needs of various types of libraries, and optimization of libraries. They also suggested additional areas of research.

Funding Methods

Braunstein addresses the issue of how well budgets reflect the level of demand for library services. A related area in need of research is the identification of factors that determine funding levels. If demand is not the major determinant of budget, what are the other determinants?

A question related to funding is how the use of fees for service affects demand. The evidence to date on fees for service has come primarily from surveys of libraries, which have inquired about the existence of funding policies and practices but have not addressed the service implications for users. User response to fees for service would probably have strong implications for institutional support for libraries.

In a similar vein, research is needed to identify the perceptions on which funders base decisions of funding levels: How do funders perceive libraries, and what evaluation data would best inform those perceptions?

Optimization of Libraries

Research is needed to address the issue of whether libraries are optimized. Until we can come to assume a reasonable degree of optimization, other investigation is misguided. This effort to define and measure an output carefully, and to determine how managerial choices may affect the level of the output, should improve the equality of library management. Paul Kantor has provided such performance measures for the Association of Research Libraries.

Another useful measure in regard to library optimization would be to examine whether libraries respond to incentives. Libraries across the country and over time face significantly different relative input prices. If libraries are optimized, we might expect libraries to economize on inputs with relatively higher prices.

Needs of Various Types of Libraries

Research on library funding must have as a basic premise an understanding that different libraries have different needs. They differ in their goals, and the measures appropriate to their evaluation must also vary. Research plans should incorporate the distinction among library goals, and evaluations should be made accordingly. Research should also incorporate the understanding that efficiency is a variable among libraries; they employ the same levels of resources to different ends and therefore have widely different measures of output. For any investigation in this area to be useful, the questions should take these variances into account.

Additional Areas of Research

- Investigation is needed of the role that technology plays in budgets, the budget process, and the collection process.

- Two articles on library funding are recommended for further reading: the 1982 National Commission on Library and Information Science report, Public Sector/Private Sector Interaction in Providing Information Services, and Jacob Cohen's article for Supplement 2 (1984) of the Encyclopedia of Library and Information Science, "The Economics of Libraries."

LIBRARIES IN THE 1990s: THE GERMAN PERSPECTIVE

The international view provides an essential perspective as U.S. library and information scientists develop a research agenda for the 1990s. The WorldNet office at the United States Information Agency (USIA) is designed to link Washington with U.S. embassies and posts overseas, providing news and feature programs for foreign broadcast. Foreign journalists and other opinion leaders at the embassy posts are linked with U.S. government officials and prominent Americans to receive the latest word on various issues. On November 4, 1987, the Office of Library Programs of the U.S. Department of Education and USIA collaborated in sponsoring an international teleconference via Worldnet on the "Challenge for Libraries in the 1990s."

The program was held at USIA in Washington, D.C., with interactive participants at USIA posts in Cologne, Frankfurt, and Stuttgart, West Germany. U.S. program speakers were:

- Dr. Robert Hayes, Dean, Graduate School of Library and Information Science, University of California at Los Angeles; and
- Sharon Rogers, University Librarian, George Washington University, Washington, D.C.

German participants were:

- Hans-Peter Geh, Director of the Wuerttemberg State Library in Stuttgart;
- Ronald Schmidt, University Library in Heidelberg;
- Herr Bienert, Librarian Training School in Stuttgart;
- Kurt Nowak, Assistant Director of the Deutsche Bibliothek in Frankfurt;
- Hans Joachim Vogt, Director of the Frankfurt Public Library;
- Dietrich Zcibelski, Frankfurt's Central Library; and
- Guenter Gattermann, Professor and Director of the Duesseldorf University Library.

The moderator for the discussion was broadcast journalist Eleanor Clift. Dr. Anne Mathews, Director of Library Programs at the U.S. Department of Education, welcomed the audiences and explained the purpose of the research project. The teleconference was heard simultaneously by more than 400 people in Washington, D.C., Frankfurt, The Hague, Bern, Bonn, Ankara, Istanbul, Lisbon, Reykjavik, Rome, and Tel Aviv.

Following the broadcast, Dr. Mathews conducted a series of international calls to Italy, Portugal, and Turkey to solicit reactions and comments from the overseas participants who had heard the telecast. The audiences were enthusiastic about the program, and copies of the tape were requested for area library schools.

Of concern to all the audiences contacted were the following topics: adapting to the effects of technology; the importance of libraries and their future role; the education and recruitment of librarians; preservation of paper; services to special populations; and international relations among library and information specialists.

Technology

The dominant theme of the discussion was how library patrons and staff could best adapt to the technological changes facing libraries, and how to manage the increasing costs of providing services for users.

Human factors were seen as the primary obstacle to incorporating new technologies, as acceptance of such changes is slow. It is evident that all levels of staff must be involved in planning, in order to promote better understanding of the reasons for these changes. For example, Kurt Nowack expressed concern about staff adjustment to the prolonged, intensive use of images on a screen.

Additional U.S. and German concerns about technology included:

- Proliferation of databases
- Providing equal access to these services, including users who may not be able to afford the fees
- Provision of educational services at minimum cost
- The need for online public access catalogs
- CD-ROM
- Automation.

The Future Role of Libraries

This discussion dealt primarily with the importance of the public library as the means by which a nation preserves its cultural heritage. Dr. Rogers also noted that as society moves from a production economy to an information economy, the library's role will expand significantly.

Education, Training, and Recruiting of Librarians and Information Specialists

The German participants were interested in the dichotomy of two different and separate curricula: one for librarians and the other for information specialists. Both are available in the United States, and some educational institutions have adopted the divided approach by putting the library program into one department and information specialists into another department, even within the same school.

Recruitment and Careers in Library Science

Stuttgart's Hans Peter Geh made the point that the library profession needs to attract the highest caliber students to the field. Dean Hayes suggested informing incoming freshmen and sophomores of the opportunities available in the library and information field, as well as which undergraduate courses would best prepare them for such a career. There was also a consensus that, because library managers need to be able to help solve the problems of an information society, they must be people with the force of character and personality to demonstrate to policy- and decisionmakers the value and importance of library and information services.

Preservation of Paper Publications

Kurt Nowack asked about preventing the loss of valuable collections because of the effects of time. This is becoming a problem of increasing concern and cost, though some foresee that the price of removing the acid content of paper will soon become more affordable. Dr. Rogers described a current project in Washington, D.C., in which a consortium of universities jointly support a storage facility that has state-of-the-art preservation equipment available to all of the member institutions in order to handle deacidification. The availability of new technologies does not, however, answer the fundamental question of which materials should be preserved.

The Role of Public Libraries in Literacy Programs

Cologne expressed interest in the role that libraries play in addressing the needs of ethnic groups. During the past decade, American public libraries have been profoundly affected by the growth in society of cultural, ethnic, and linguistic diversity. In addition, demographic projections suggest that there will be increasingly large numbers of senior citizens. To serve these groups, there is not only a need for collections of special materials, but also a need to prepare librarians who have a mixed cultural/ethnic heritage, diverse linguistic abilities, and a background in sociology.

International Exchanges

Mr. Gatterman observed that efforts toward international cooperation among librarians have decreased, possibly due to the scarcity of travel funds. All participants agreed about the importance of international exchanges. In order to encourage more exchanges, one American university funds a faculty position for visiting professors from abroad and sponsors cooperative programs for the exchange of faculty and students. Programs comparable to the Fulbright are needed to encourage and expand opportunities for integrating the international information community. German professionals are interested in exchanges of their librarians with those of France, Great Britain, and the United States as part of an effort to strengthen ties among members of the profession. In tandem with exchanges, they recommend the use of satellite capabilities to record library science courses by U.S. professors for use in library schools abroad.

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